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SURGERY OF THE BILIARY TRACT

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THE Southeastern Surgical Congress is one of the great mainstays of our American medicine, and an invitation to appear before it is something which any surgeon must regard as an honor. Meetings such as this are the fountains at which medicine pauses to refresh itself, to estimate and consolidate its recent gains, to raise the general level of practice, and to gird itself for the exploits of the future. In our profession, the goal is never attained. The greatest man among us still has something to learn; and if he will but search his intelligence and his heart, the least of us will find some treasure for the enlightenment or guidance of his fellows. This is the ancient spirit of medicine in our America. While it prevails, there shall be no turning back.

The last decade has witnessed the growth of a new outlook upon the management of biliary disease. It is a working philosophy which has guided the speaker and his associates in all their cases of biliary surgery since 1932. The growth of the idea is illustrated by the trend of the recent literature on biliary subjects. The presentation offered today is based upon the review of 2501 cases of biliary tract disease studied by our group during the last 25 years. Before the Ohio State Medical Association in 1939, we reviewed the subject of biliary tract disease in the light of our management of 209 cases of common duct obstruction. Upon that occasion we emphasized the desirability of a much broader study of the entire biliary system. Our latest observations, presented in this paper, confirm the conclusion.

This paper is based upon the original group of cases, plus 76 new cases which we have studied since the 1939 presentation.

Read before the Postgraduate Surgical Assembly (the twelfth annual meeting) of The Southeastern Surgical Congress, Richmond, March 10, 11 and 12, 1941.

It is appropriate at this point to name the four problems which we regard as the major issues of biliary tract surgery:

1. Removing the obstruction within the ducts.
2. Treating and managing infection within the biliary tract and its surroundings.
3. Establishing the free drainage of bile into the intestinal tract.
4. Preventing a recurrence of the original disease.

In our opinion, these four points are the articles of one broad concept, namely—

The management of the pathology and its correction, with special attention to the residual infection in the liver—which, in our opinion, can only be relieved by long drainage of the common duct.

In other words, our view is that the surgeon's outlook upon biliary disease should be all-embracing: It should view the gallbladder, the liver, the ducts, and the pancreas as a whole—as a system of related parts.

In 1932, from a review of the use of radio-opaque oil in 15 cases requiring a minute study of the common duct and the biliary system, our conclusions were (1) that early operation is to be favored; (2) that radio-opaque solutions should be used more generally as a medium for study prior to the removal of drains, and (3) that a most careful examination of the facts thus collected is desirable It was argued that this procedure would reduce the morbidity rate and also the 6 per cent with recurring symptoms.

In 1935,[16] the results of 116 cases of surgery for common duct obstruction were reviewed with a recommendation for an early operating policy to prevent duct system infections and the formation of stones and obstructions.

History

Reviewing other literature on the use of radio-opaque substances in biliary work, we find:

1. Cotte's[1] studies in 1925 of three cases of postoperative biliary fistula in which lipiodol had been used.
2. Mallet-Guy, Beaupere, and Armanet's[2] warnings in 1927 of possible complications following lipiodol injections.
3. The Piccinino-Pazienza[3] report in 1927 on gleo-barium solution to facilitate observation of the biliary tract after surgery.
4. Caeiro's[4] report in 1928 on postoperative biliary fistula, using lipiodol, followed in 1930 by a published work of Ginzburg and Benjamin[5] on the same subject. The latter two noted the reversal of flow in the hepatic ducts in the presence of a common duct obstruction.
5. Overholt's[6] 1930 review of the literature, and Cotte's remarks on the

value of radio-opaque studies of the biliary tree before the removal of T-tubes.

6. Mediums and technic descriptions published by Douglass and Hufford.[7]

We favor the use of 20 c.c. of brominol (a brominized olive oil) allowing a gravity flow through the tube under fluoroscopic control 10 or 12 days after the operation (fig. 1).

Fig. 1. T-tube in common duct. Common duct within normal limits. Hepatic ducts well outlined. No evidence of dilatation. Extensive arborization. Patency of common duct, with opaque medium in small bowel.

Removing Obstructions

The first requisite is the choice of an operation fitting the needs and peculiarities of the lesions of each individual case.

Case history, examination, and laboratory findings prepare the way, and then we prepare the patient himself for the ordeal of surgery. We may mention the generous administration of fluids; intravenous and oral doses of glucose; before-and-after blood transfusions for the ill and jaundiced patient.

Bile and vitamin K are given by mouth. In this connection, we may note Stewart's[8] testimony on the frequent reduction of the plasma prothrombin in obstructive jaundice. Striking also is the same writer's statement elsewhere that "prothrombin deficiency refractory to treatment may be seen in severe liver damage and in chronic sepsis."[9]

Bleeding—always an important consideration—is to be checked by frequent blood replacements by transfusion.

Hemorrhage incidence has been kept low throughout the series—by rectal or nasal tube administrations of bile and by the clamping of the T-tubes to direct the flow of bile into the intestinal tract. The record shows three bleeding cases which progressed to recovery.

Fig. 2. Section of liver showing fibrosis and inflammatory cell infiltration around the biliary ducts. There is also some fatty degeneration in the liver cells.

Two deaths from bleeding occurred before the adoption of this technic.

Adequate preparation of the patient and adequate exposure of the gallbladder and ducts conform with the requirements of pathology. Cystic duct and artery abnormalities must be kept in mind along with the irregularities that occur in the location of hepatic ducts and arteries. The surgeon can avoid injury by pausing to verify the identity of the duct or artery in view.

It is best to open the dilated common duct near the duodenum and to establish its patency.[17] In this series, 38 ducts yielded gravel or stones among 49 ducts opened where stones had not been palpable.

The Care of Infection

Long drainage of the common duct has been the rule in our handling of severe cases of hepatitis. We have reduced morbidity and increased the ratio of cures (fig. 2).

The dilatation of the liver radicals has been established as a fact among patients with a long history. We have observed a gradual reduction of dilatation after the establishment of adequate drainage (fig. 3).

A third of the cases in our series had had symptoms over a 10-year period.

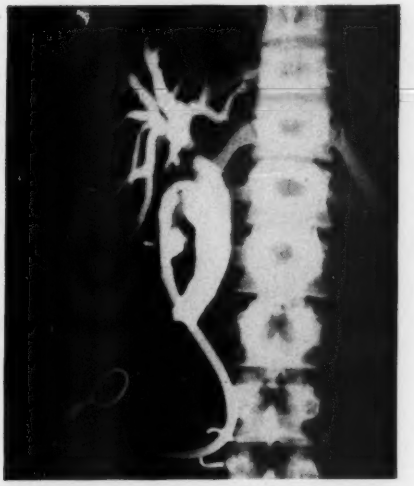

Fig. 3. T-tube in stump of cystic duct. Common duct markedly dilated. Hepatic ducts dilated. Marked clubbing and blunting. No opaque medium in small bowel.

Suitable drainage reduced the dilatation of case 2.

A comparison of cures after common duct drainage and cures after cholecystectomy without drainage yields an interesting conclusion.

An overlooked stone or a chronic liver infection were the real causes of suffering among non-drainage patients who returned to us with symptoms labeled by such terms as "residual hepatitis," "chronic pancreatitis," and "spastic bowel."

Establishing the Free Flow of Bile Into Bowel

The patency of the ampulla of Vater must be established—this is important!

Saline irrigation of the hepatic and common ducts is indicated when gravel or thick bile is present in the duct.[10]

Glucose administrations through the T-tube is good practice when a satisfactory closure of the duct and the tube has been ob-

tained. We have found this a good means of washing small particles of gravel into the duodenum.

In this connection, D. MacDonald[11] reports "a new postoperative method of cleansing the biliary ducts, and of application of thermostatically controlled heat to the interior of the biliary tract." Mac-

Fig. 4. Indwelling catheter in common duct extending into the duodenum with T-tube inserted in catheter. Hepatic ducts outlined. Moderate dilatation. Opaque medium in small bowel.

Donald asserts that "since cholecystectomy does not remove all the pathological changes in biliary-tract disease, an effort to produce a normal duct system should be made in selected cases. This can be done by using a common duct drain as part of a perfusion apparatus, which should result in a reduction of the incidence of postoperative symptoms."

Where there are inflammatory conditions or injuries, repairs can be made over a Douglass[12] modification of the McArthur drain for delivering bile into the duodenum. T. E. Jones[13] reports the use of a T-tube to simplify the repair of the common duct and obtain a discharge of bile into the bowel.

Our opinion is that anastomosis should be done at once and over a tube to serve the time factor. It is not necessary to pause for a location of the duodenal end of the common duct. Our experience

has been that nothing more than small fibrous bands remain (fig. 4).

No sovereign rule governs every problem of inflammatory obstruction—each has some peculiarity all its own.

The guiding principle, never to be overlooked, is to obtain a permanent and rapid re-establishment of the bile flow into the bowel.

Fig. 5. Common duct markedly dilated. Hepatic ducts dilated, blunted and clubbed. Duct of Wirsung visualized. Opaque medium in small bowel.

Preventing Recurrence

Study of the biliary tree with radio-opaque medium is, we believe, the best approach to preventing recurrence (fig. 5).

We watch the following factors—the rate of the bile flow into the bowel; the dilatation of the liver radicles; the degree of the patient's comfort with the common duct filled.

It is the part of caution to keep the drain in place until symptoms are at a minimum. It is then possible for such patients to go about their work with the tube clamped, and we have found that they do not object to fluoroscopic re-examinations when new data on symptoms are being collected.

Examining our statistics from 169 cases studied with opaque medium, we note that 44 had had previous gallbladder surgery; 18 had had cholecystostomy; 14 had had cholecystectomy, and 12 had had a previous choledochotomy.

Among the reoperative cases, stones were present in all but 5, and in these five we discovered common duct distortions from adhesions. In this group of cases, all symptoms subsided after the adhesions had been removed and the common duct drained. The second operations in this group yielded no stones and the patients remain without symptoms.

Comment

1. A comparative study indicates that residual infection is a very important consideration among patients with recurring symptoms.

2. A comparison of the biliary tree and the flow of dye into the bowel is a method of substantiating adequate drainage.

3. Careful study and the use of vitamin K in association with the prothrombin estimations give the surgeon a better control of his patient and complications, but it appears to remain true that prothrombin recovery is limited by the advance of liver damage.

4. Our review of 2501 gallbladder cases includes 29 cases of acute gallbladder disease in young patients under 20. Their operations were performed before there had been any important degree of liver damage from infection, and all are free of postoperative symptoms.

5. Vastly different, however, is the situation of patients with symptoms of biliary infections ranging beyond a 10-year period. Residual complications, with few exceptions, appear in this older group. Cases with slight dilatation of the ducts, or none at all, are free of postoperative symptoms. Old cases require long drainage. Thorough drainage of the dilated common duct is the necessary condition for a maximum end result.

6. In the case of accidental damage to the ducts or of adhesions around the ducts, it is imperative to re-establish the flow of bile into the bowel.

7. Radio-opaque oil was used in 169 patients; 145 females; 24 males. The youngest was 16; the oldest was 79; the average age was 52.

8. The most constant symptom, pain, occurred in 98 per cent of the cases. Nausea and vomiting were present in 95 per cent, and chills occurred in 18 per cent. The shortest period of symptoms was 2 months; the longest, 22 years; the average, 11 years.

9. Twelve deaths occurred. The causes were: bronchopneumonia, 4; cardiac, 3; hemorrhage, 2; peritonitis, pulmonary embolus and liver insufficiency, 1 each.

10. A history of jaundice was obtained in 48 per cent of the cases. Twenty per cent returned a positive culture from the ducts, and 60 per cent had no growth. No statement was obtained in 20 per cent.

11. Among the 157 surviving cases, 6 had recurring symptoms, were reoperated upon and had stones removed from the common duct. The tubes were not properly cared for in 2 other cases and by accident were removed early—1 before a study of the ducts could be made.

In one case, a delay in the passage of the dye into the duodenum was observed in x-ray examination and this case required long drainage. Symptoms persisted after the premature removal of the tube, but within two months the patient consented to a replacement of the common duct drain. Three months of drainage was attended by the gradual decrease of symptoms. The tube was removed after having been clamped for 10 days without discomfort, and the patient remained free thereafter of symptoms.

13. Transfusions, bile salt administrations with vitamin K (cholic acid), and the maintenance of water balance, as advocated by Coller[14] and Maddock[15] shorten the time of preparation and reduce the operative risk. In the postoperative period, the same procedure is to be continued until restoration of the liver function and disappearance of jaundice.

Conclusions

1. A report of 285 cases of common duct obstruction has been given.

2. Radio-opaque dye was used in 169 cases for study of the biliary tree.

3. When an infection of the liver and the ducts is present, satisfactory drainage must be provided.

4. A radio-opaque medium, used early in the postoperative period, facilitates early diagnosis of an overlooked stone or an inflammatory obstruction.

5. No contraindications for the use of radio-opaque oil have been observed.

6. The ratio of cures in biliary disease is increased by the policy of early operations.

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THE PRINCIPLES GOVERNING THE DIAGNOSIS AND TREATMENT OF ACUTE CRANIO-CEREBRAL INJURIES

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The symptoms just mentioned do indeed very frequently accompany a broken scull, but they are not produced by the breach made in the bone; nor do they indicate such breach to have been made. They proceed from an affection of the brain, or from injury done some parts within the cranium, independent of any ill which the bones composing it may have sustained.

—PERCIVALL POTT, 1760[1]

THE words of Percivall Pott quoted above were written in 1760, but they might well be hung on the walls of every hospital of 1941. For the first lesson to be learned about head injuries is that their symptoms result from damage to the brain and that their treatment must be directed toward alleviaion of this damage and prevention of further cerebral injury. Injuries of the cranial bones are coincidental and are of importance only in so far as they contribute to the cerebral damage.

Of equally fundamental importance is the fact that the nerve cells of the brain, once destroyed, do not regenerate. Destruction of tissue by a laceration of the brain is an irreparable loss, though, happily, the organism can tolerate permanent loss of large amounts of tissue from some areas of the brain with surprisingly little functional defect.

On the other hand, the function of nerve cells may be temporarily interrupted or impaired by compression, but this function will return if the severity and duration of the compression are not too great.

Since the damage sustained by the brain at the moment of injury (such as laceration or the instantaneous phenomenon of concussion) is irreparable, it naturally follows that treatment must be directed toward the alleviation of existing compression and the prevention of further damage to the brain. Such further damage can occur in only two ways: by continued or increasing compression and by infection. An understanding of the physiologic and pathologic alterations associated with these two injurious factors constitutes the basis for the rational treatment of acute cranio-cerebral injuries.

CEREBRAL COMPRESSION

Cerebral compression may be localized or generalized or both. Purely localized compression may be produced by a depressed fragment of bone, a foreign body or a localized hematoma. Such a

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local compression does not constitute a danger to life per se, but is very frequently followed by subsequent complications. Depressed fractures produce cortical scars,[2] foreign bodies introduce bacterial contamination, and hematomas may enlarge by osmosis. Therefore, localized compression of the brain nearly always demands surgical removal of the cause of compression.

On the other hand, generalized cerebral compression, or increased intracranial pressure brings into play a distinctive and fundamental physiologic mechanism encountered nowhere else in the body.

In 1783, the second Alexander Monro[3] demonstrated to his students at Edinburgh that water contained in a glass sphere from which issued two tubes would not run out of one tube, if the other were occluded. Thus, for the first time he called attention to the fact that the cranial contents constitute an incompressible substance situated within a rigid container.

In 1818, Abercrombie[4] asserted that any intrusion on the brain could occur only at the expense of the circulating blood volume.

Forty years after Monro's publication, his pupil, George Kellie,[5] of Leith, carried out extensive experiments on animals and dissections on human cadavers to demonstrate the same point. He stated,

> The brain itself, little compressible, is contained within a firm and unyielding case of bone, which it exactly fills. . . . It does not then appear very conceivable how any portion of the circulating fluid can be withdrawn from within the cranium without its place being simultaneously occupied by some equivalent; or how anything new or exuberant can be intruded without an equivalent displacement.

It will be observed that Monro and Kellie failed to take into account the cerebrospinal fluid, whose significance was not generally recognized until the publication of Magendie's[6] monograph in 1842. Galen had thought the fluid was a transmitter of the *spiritus animus*. Its presence had been noted by Vesalius and its importance hinted by Cotugno[7] in 1764. In 1815, Seeds[8] observed a "watery effusion" in the cranial cavities of experimental animals and Kellie[5] himself confirmed this observation, but both thought it represented a pathologic state.

Nevertheless, the concept of the skull as a closed and rigid-walled chamber of constant volume was of fundamental importance and came to be known as the Monro-Kellie Doctrine. It was given final confirmation in 1919 when Weed and McKibben[9] produced *negative* cerebrospinal fluid pressures by the intravenous administration of hypertonic solutions. They concluded,

> The cranial cavity is relatively fixed in volume and is completely filled by brain, cerebrospinal fluid and blood; variations in any of the three elements

may occur, compensation being afforded by alteration in the volume of one or both of the remaining elements.

Modern knowledge of the subject has been summarized by Cushing[10] and by Weed.[11]

With this concept in mind we can better understand the phenomena of increased intracranial pressure. When this increased pressure occurs very slowly, as in cases of brain tumor, the compensation for the volume of the tumor occurs largely through cerebrospinal fluid adjustment, the circulation of blood remaining adequate.

But when the rise in pressure is rapid, as in cases of head injury, only a diminution in intracranial blood volume can compensate with sufficient rapidity. This results in cerebral anoxia. When the vasomotor and respiratory centers in the medulla lack oxygen, there occur a reflex rise in blood pressure and slowing of the pulse. The respirations become slow, stertorous, labored and sometimes irregular or periodic. Simultaneously, the oxygen lack results in a progressive lowering of the state of consciousness through the stages of lethargy, drowsiness, stupor and coma to actual death.

In addition to this primary mechanism, increased intracranial pressure sets up a vicious cycle. The increased pressure produces venous obstruction and diminished outflow of blood. By the hypothesis of Monro and Kellie, this must mean still greater increase in pressure, still more impairment of circulation and still more severe medullary anoxia.

Following injury to the head, the intracranial pressure can be elevated in only two ways: by swelling of the brain or by the development of an intracranial mass, such as a hematoma. These types of lesions must be considered separately.

Swelling of the Brain. In the great majority of severe head injuries, there is no gross hemorrhage or deforming fracture, but the subsequent elevation of intracranial pressure may produce severe symptoms or death.

The mechanism of this increase in pressure is in reality unknown, but, in the literature, it is almost universally ascribed to "cerebral edema." This edema was thought by Leonard Hill,[12] in 1896, to be squeezed out of the capillaries by cerebral compression, by Courtney,[13] to be the result of vasomotor paralysis, by Cannon[14, 15] to result from cerebral anoxemia. Arnaud,[16] Denis,[17] Karitzky,[18] Hauptmann[19] and many other continental European writers postulate a "traumatic hydrocephalus." Häussler,[20] Jorns[21] and other German authors distinguish between *Hirnschwellung* and true *Hirnödeme*. Experimentally, Weed and McKibben[22] demonstrated

alterations in the total bulk of the brain after intravenous injections of hypertonic and hypotonic solutions, but did not determine such variable factors as blood volume and ventricular size. The unsettled state of this controversy has been admirably discussed in a comprehensive review by Lehman and Parker.[23] These same authors[24] found experimentally that the intracranial pressure could be increased by increasing the osmotic pressure of the cerebrospinal fluid with injections of blood serum or defibrinated blood.

In our laboratory, it has been shown that the water content of the brain is remarkably constant under various conditions such as trauma (Pilcher[25, 26]), acute uremia, cerebral venous obstruction, hyperthermia and heavy roentgen irradiation (Wyatt and Pilcher[27]). Some of these observations have recently been confirmed on traumatized human brains by Shapiro and Jackson.[28]

In the face of this uncertainty regarding the mechanism of the increased intracranial pressure, it is not surprising that the treatment is also a matter of controversy.

In 1919, Weed and McKibben[9] showed that the cerebrospinal fluid pressure could be rapidly reduced by the intravenous injection of hypertonic solutions. Their observations were quickly given clinical and experimental tests by Foley,[29] Foley and Putnam,[30] Sachs and Malone,[31] and Sachs and Belcher[32] and were promptly confirmed. The use of concentrated solutions of dextrose or sodium chloride intravenously or of magnesium sulfate by mouth or by rectum became a standard method of treatment in cases of head injury. For similar reasons, rigid restrictions of fluid intake was also advocated, particularly by Fay.[33]

With further investigation, however, objections to this "dehydration therapy" appeared. Massermann[34] showed that cerebrospinal fluid pressure which had been lowered by hypertonic solutions soon returned *above* the initial level. Somewhat similar results were obtained by Pilcher.[25] The diuresis and fluid restriction often resulted in severe dehydration. More recently, the use of sucrose, introduced by Bullock, Gregerson and Kinney,[35] has given improved results, but the prolonged employment of this therapeutic method is not without danger.

Similarly the use of spinal drainage has been strongly advocated for the reduction of intracranial pressure especially by Munro[36, 37] and Fay.[33] On the other hand, spinal drainage has been condemned by Sachs,[38, 39] Dandy,[40] Coleman[41] and others, because of the danger of herniation of the brain stem into the spinal canal.

In man and animals Haug[42] and Massermann[43] have shown that

the beneficial effects of spinal drainage may be very short-lived and that the subsequent pressure may be higher than ever. Spring[44] has found that the amount of blood in the subarachnoid space cannot be significantly reduced by spinal puncture.

Dandy[40] advocates subtemporal decompression in many cases, but this procedure is rarely employed by other neurosurgeons—only twice in the past eight years at the Vanderbilt University Hospital.

It is to be concluded, then, that the therapy of this type of case should consist essentially of complete rest, of sedation as required, of the occasional judicious use of hypertonic sucrose solution and of careful observation for signs of complications such as hemorrhage or infection. It should be urged that morphine *never* be given, for this drug adds to the depression of respirations which may already have resulted from the increased pressure.

Intracranial Hemorrhage. Post-traumatic bleeding may be arterial or venous and the two types of hemorrhage produce entirely different pathologic and clinical pictures.

Arterial hemorrhage is nearly always from the middle meningeal artery or its branches. The clot is extradural and grows rapidly with increasing evidence of general and local compression. Typically, the patient has a lucid interval, followed by rapid depression of the state of consciousness, rising blood pressure, falling pulse rate, homolateral pupillary contraction and contralateral hemiplegia, beginning in the face and progressing to arm and leg, in order. Atypically, many bizarre symptoms may occur, as recently pointed out by Woodhall, Devine and Hart.[45] The condition constitutes an acute surgical emergency. The location of the clot must be determined by the neurologic signs rather than by the site of the blow. Sometimes, bilateral exploration by burr-hole may be necessary.

Venous hemorrhage may be subdural, subarachnoid or intracerebral. Regardless of location, the bleeding is likely to be slow, the symptoms gradually progressive or occasionally not immediately perceptible at all.

Subdural clots usually result from the tearing of veins bridging the gap between the cortex and one of the great dural sinuses, especially the superior longitudinal sinus. The clot gradually accumulates and produces moderate signs of a general increase in pressure which may be indistinguishable from those caused by swelling of the brain. If undisturbed, the clot is rapidly enclosed by a membrane of flat mesothelial cells and becomes a "chronic subdural hematoma" or, as Virchow[46] called it eighty-six years ago, "pachy-

meningitis hemorrhagica." Due to the protein concentration of its contents, the hematoma exerts a high osmotic pressure and may draw fluid into its sac, thus exhibiting slow progressive enlargement. These lesions have been admirably described by Putnam,[47] McKenzie,[48] Munro and Merritt,[49] and others.

The older, thick-walled hematomas require open removal, but the more recent ones, with thin membranes, may be evacuated, "washed out" and drained through simple burr-holes, a method described independently by Fleming and Jones[50] and by McKenzie.[48] It is important to remember that subdural bleeding very frequently occurs bilaterally.

Subarachnoid hemorrhage results in diffusion of blood in the cerebrospinal fluid, but rarely in the formation of localized clots, unless there is frank laceration of the brain.

Intracerebral hemorrhage, however, sometimes results in the formation of localized subcortical hematomas. These may produce general and focal cerebral symptoms at once or may remain "silent" for long intervals. Ultimately, convulsions and other irritative symptoms are likely to occur. Pathologically, these lesions also become encapsulated, often undergo calcification and give rise to surrounding cicatrization (Pilcher[51]). Their treatment should be surgical, at whatever time they are recognized.

Intracranial Infection

Bacterial contamination of the cranial contents involves additional factors not encountered elsewhere in the body. The cerebrospinal fluid circulation constitutes a medium for the rapid and widespread dissemination of organisms. The confinement of infection within a rigid container results in the pressure phenomena already discussed. The problem of the dreaded fungus cerebri is sometimes insoluble.

The brain is well protected from infection, however, and it is well to remember that post-traumatic intracranial infection can occur, for all practical purposes, only if there is a break in the continuity of its protecting walls, the skull and dura mater. Such a portal of entry for bacteria may be provided by an obvious compound fracture, by a basal fracture with rupture of the ear-drum or of the mucosa of a paranasal sinus or by a penetrating wound. So long as such an opening persists, the door is open to pathogenic organisms and its immediate closure is usually essential.

Contaminating organisms may produce three types of infection (or combinations of the three). Invasion of the subarachnoid space

results in meningitis. Gross, contaminated wounds of the brain may produce a spreading, fatal cerebritis. Or a localized cerebral abscess may occur. When the pia mater is not injured, infection may still penetrate deeply into the brain by way of the perivascular spaces of Virchow-Robin.

The experiences of Cushing,[52, 53] Horrax,[54] Harvey[55] and others in the last war and a comprehensive experimental study in our laboratory[56] indicate that certain factors are of particular importance in the development of infection following wounds of the brain:

1. Most important of all is the time element. When such a wound remains open more than twelve hours, it is an infected wound. Its devitalized tissue and blood clot are ideal culture media. On the other hand, the brain is remarkably resistant to infection and wounds properly treated within twelve hours heal per primam in a high percentage of cases.

2. Danger of infection is greatly increased if the ventricle is penetrated.

3. Foreign bodies which communicate with the skin, the subarachnoid space or the ventricle are far more dangerous than those remaining embedded in the cerebral substance.

It is obvious that compound fractures of the vault of the skull are surgical emergencies. In cases with simple linear fractures, thorough cleansing and closure of the scalp wounds are adequate. In more extensive injuries in which the dura is lacerated, wide exposure is essential, often requiring extensive removal of bone.

The term "débridement" as applied to craniocerebral wounds should include the excision of only the most severely macerated scalp, the removal of loose and indriven fragments of bone and the evacuation by the irrigation-suction method of Cushing[52, 53] of all free, crushed and obviously devitalized cerebral tissue. With regard to foreign bodies, a wise rule is that they should be removed, if this can be accomplished without significantly increasing the damage already sustained by the brain.

Within the first twelve or eighteen hours, such wounds should be closed without drainage. Fascial transplants to fill dural defects and plastic procedures on the scalp are sometimes necessary. When the wound is already infected, adequate open drainage must be provided. The cerebral hernia which inevitably forms will retract spontaneously as the infection subsides.

The chemotherapy of cerebral infections is still an unsolved problem. The sulfonamide drugs do not pass from the blood stream into the cerebrospinal fluid in adequate concentration. Experimental study of this problem is in progress. Preliminary evidence suggests

that the intrathecal administration of the drugs may prove to have great value.

Summary

1. The primary consideration in craniocerebral injuries is the damage sustained by the brain.

2. The brain lies within a rigid container, in which also are cerebrospinal fluid and circulating blood.

3. Injuries of the head may damage the brain by (a) direct and instantaneous destruction of nerve cells, (b) compression or (c) infection.

4. Generalized compression of the brain may result from swelling or from hemorrhage.

5. Increased intracranial pressure may be relieved temporarily by hypertonic solutions or by spinal drainage, but these measures may be quite dangerous and should be employed, if at all, with great care.

6. Intracranial hemorrhage usually requires surgical treatment and arterial hemorrhage constitutes a grave emergency.

7. Post-traumatic infection results only from compound fractures, usually with penetration of the dura mater.

8. Infection may be confined to the meningeal spaces or may involve the brain diffusely or locally.

9. Compound fractures should be treated at the earliest possible moment by thorough cleansing, removal of devitalized tissue, extraction of all accessible foreign bodies and closure without drainage.

10. Chemotherapy may prove to be of great importance in the treatment of cerebral infections.

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TRAUMATIC FISTULA OF STENSON'S DUCT

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LACERATIONS of the face with severance of the duct of the parotid gland are rather uncommon, and fortunately so, as their repair is difficult. Needless to say, in any type of laceration involving this part of the face, one must consider the possibility of a severed Stenson's duct and search for it carefully. It is embarrassing to suture these lacerations and then a few days later find saliva oozing out along the suture line.

A case in which there was a severance of the duct by laceration, is reported because of the excellent results obtained by using a method of repair described by Glascock.

The method of repair described by Glascock was based on a modification of Homans' method. It consists of passing a metal probe through the buccal opening of the parotid duct into the wound. A strand of fine black silk is twisted firmly about the end of the probe presenting itself in the wound, and the probe is drawn back into the mouth. The long end of the strand of silk left in the wound is then tied about the hooked end of an extra coarse strand of silkworm gut and by traction on the buccal end of the silk this is drawn into the mouth. The proximal end of the severed duct is now located by having the patient drink lemon juice and watching for the resultant flow of saliva into the laceration. A probe is then passed into this portion of the duct and on into the substance of the parotid gland. At the point where the probe tents the skin a small nick is made to permit its escape. A strand of black silk is then twisted about the portion of the probe presenting in the laceration and drawn through the wound. The proximal end of the silkworm gut is then fastened to the strand of silk and drawn out through the small nick in the skin just anterior to the ear. A shot is then placed on each end of the silkworm gut and the wound closed snugly with through and through sutures. A sinus tract forms about the silkworm gut in 4 to 6 weeks, and at this time it is removed.

REPORT OF CASE

A negro woman, aged 38 years, was first seen Sept. 14, 1940, complaining of serous drainage from a laceration of the face sustained by a razor cut during a fight ten days previously. The wound had been sutured immediately, but she had noticed serous drainage ever since, particularly at meal time. Examination revealed a long, curved incision extending across the right side of the face from the region of the zygomatic arch to the chin. There were several small openings through which serous drainage escaped upon stimulation of salivation. A diagnosis of severance of Stenson's duct was made and

under local anesthesia it was repaired after the method described. The silkworm gut was left in place four weeks. At this time the wound was well healed and there seemed to be a normal flow of saliva from the buccal opening of the duct. Examination 6 months later revealed an apparently diminished,

Fig. 1.—Facial appearance at the end of 6 months. The small scar just anterior to the ear represents the point at which the strand of silkworm gut passed through to the skin from the proximal end of the severed duct.

but definite salivary flow, and the facial appearance noted in fig. 1. The small scar just anterior to the ear represents the point where the strand of silkworm gut passed through to the skin from the proximal end of the severed duct.

SUMMARY

A case of traumatic fistula of Stenson's duct in which a modification of Homans' method for repair of traumatic fistulas of Stenson's duct as reported by Glascock was used with success, is reported.

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THE RELIEF OF CONTRACTURES OF THE KNEE FOLLOWING EXTENSIVE BURNS

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EXTENSIVE burns are always followed by contractures and such contractures when they involve the popliteal space produce crippling deformities. It is impossible to prevent scar contractures in the region of a joint by bandaging with the joint kept in extension although they can be prevented by re-surfacing the burned area with skin before the contractures have had time to develop.

It is not the purpose of this paper to discuss the early treatment of a burn. However, there is still considerable difference of opinion among people interested in burns as to what is the best method of treatment and burns still present many unsolved problems. In any case, treatment should be directed towards first saving the life of the patient and doing everything possible for his comfort, and, second, rehabilitation with restoration to as near normal as possible at the earliest date. There is no doubt that skin grafting is the method of choice to accomplish the second objective.

Occasionally, we see recently healed cases of burns involving the popliteal space that have been allowed to heal spontaneously without skin grafting, and which show contracture of varying degree. If the burn was not extensive a few of these cases may straighten out with use—possibly assisted by massage and exercises. Another helpful procedure is for the patient to wear a plaster splint at night, with the knee in full extension to prevent any tendency of the knee to flex.

For the mild contractures, following burns involving the popliteal space that do not correct spontaneously, it often is possible to correct them by the use of a plaster cast extending from the toes to the upper thigh. The cast is cut three-fourths of the way around, posteriorly and on both sides, leaving a hinge of plaster on the anterior surface. The knee may then be extended as much as comfort will permit and held with wooden blocks or wedges inserted in the posterior cut. The thickness of the wedge may be increased every three or four days thus gradually forcing the knee into full extension. The cast should be changed every ten to fourteen days to prevent pressure sores.

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It is possible to get flexion contracture at the knee from burns that did not involve the popliteal space at all but destroyed the immediately adjacent skin. The contraction of the burned area pulls and stretches the surrounding skin and may produce a flexion contracture unless efforts are made to overcome this pull by keeping the knee in extension. Such contractures may often be overcome however by the use of the wedging plaster just described.

The above groups of more or less mild cases thus do not present such a difficult problem but the severe cases involving extensive and deep losses are entirely a different matter. The care of an extensive burn is time consuming and tedious; and so often a busy doctor does not have the time to give to these patients and relegates this task to a nurse or assistant who may or may not have had sufficient training or instruction in their care. We do not mean to throw off on the nurse because, after all, burns are largely a nursing problem and in our own practice these duties are performed for the most part by nurses who have been instructed along these lines. We see so many cases who have been permitted to wear foul smelling dressings, soaked with discharge. These patients are absorbing toxins, running a high fever with severe anemia; their morale is low and they live dreading the pain and discomfort that they know will accompany each change of dressing. Such a picture is familiar to all surgeons; it can and should be prevented.

Another important consideration in connection with these patients is the economic side with all the expense of prolonged hospitalization, medical care, and loss of time from work. Anything to shorten the period of convalescence is most important. The indication here is unquestionably getting the burned area ready for grafting as soon as possible and then resurfacing with skin. If this resurfacing is done early enough, it will prevent the occurrence of contractures and thus save a step, or possibly a series of steps, in the restoration.

The cases which are not seen until the burned area has been covered with scar epithelium and the contractures full developed may be rather easy to correct or extremely difficult, especially if there has been any change in relationship of the bones entering into the formation of the joint. We feel that these can best be treated by the cooperation of a plastic surgeon and an orthopedic surgeon.

Scar epithelium is a poor substitute for skin. It is thin, poorly supplied with blood, and will not stand up under even the slightest trauma. It scales and cracks, leading to the formation of open ulcers which are difficult and slow to heal; and the formation of a cancer in an old burn scar occurs often enough to be significant. Such scar epithelium in addition to the tough, binding, underlying

scar tissue, should be dissected off very carefully down to normal tissue. In making this dissection, special care should be taken not to injure the popliteal vessels and the nerves (both sensory and motor) that are found in the popliteal space as well as the peroneal nerve towards the lateral side which often is found quite superficial and may be mistaken for a tendon of one of the ham string muscles. When all the bands of scar tissue and epithelium have been removed, the resulting defect will be much larger than the size of the removed area of epithelium and the knee may be partly or fully extended. It is a mistake to use too much force in an effort to obtain full extension—the surgeon should always be gentle and the use of too much force may do irreparable damage. After removal of all binding scar, and with mild traction holding the knee in as much extension as possible, the ham string tendons may stand out as cords and it is a great temptation to lengthen these tendons. We have tried this but have found that it is not indicated and that the belly of the muscle will stretch sufficiently to permit as much extension as should occur at this time: lengthening the tendon accomplishes nothing of advantage.

The raw area is then covered with a skin graft. We have tried all the different types of skin grafts on these cases and, although we do not propose to go into the indications for and against the use of any of the different types, we have found that the split graft of Blair is the best for most cases. This graft is easily and quickly obtainable in almost any size, leaves no problem of getting the donor area healed, contracts very little, and when properly applied and cared for, should "take" in a high percentage of cases. A heavy dressing with sponge pressure is applied snugly. A plaster cast is sometimes applied over the dressing to give better immobilization and to maintain extension. The first dressing is changed on the fifth postoperative day and after that daily, or as often as seems indicated. When healing is complete, and if slight contracture still exists, a wedging plaster is applied and by its use the knee is straightened within a few days.

For the long-standing and more severe cases, the problem is more complicated. After the web back of the knee has been released and the scar tissue largely replaced with skin, the knee still cannot be brought into full extension because of adhesions and bony changes which have occurred in the knee joint itself. Weight and pulley traction is not very satisfactory, because the patient will change his position in bed and relieve the pull. The "Hoke plaster traction apparatus" is an efficient method of applying traction. This consists of a double plaster spica, with a cast on the well leg, and a metal

Fig. 1. Eight year old boy who was burned with fire twenty-one months before admission. He was in two hospitals during this time. Received various kinds of light treatments, but no skin grafts. The burn involved two-thirds of the circumference of the thigh, and completely surrounded the lower leg below the knee. There was a large granulating area involving popliteal space and lower half of thigh posteriorly. Knee could be extended only to within 20 degrees of a right angle. He had only 5 degrees of motion in the knee, which was also posteriorly dislocated. The right hip was adducted and could be abducted only to within 20 degrees of the midline. The hip was dislocated and lacked 70 degrees of coming down in full extension. The tibia presented 70 degrees of outward torsion, and the foot presented an equino-varus deformity.

The infection in the ulcer was cleared up with wet dressings, and pinch grafts were applied to cover the denuded area. The flexion deformity of the knee was corrected by a Hoke plaster traction apparatus. Later the scar tissue was dissected from the popliteal space and a whole thickness skin graft of approximately 50 sq. cm. was removed from the back and applied across the popliteal space. A year later another whole thickness skin graft of about the same size was applied to relieve the remaining contracture.

extension apparatus on the side of the burned leg. Traction is made by means of adhesive attached to the lower leg and ankle, and this attached to the windlass at the end of the apparatus. By tightening this apparatus once a day the contracted tissues are stretched without doing harm to the joint.

If the contracture is of long standing and there is a posterior dislocation at the knee, caused by the pull of the hamstrings and scar tissue, the traction is modified so that there is also traction forward over the upper end of the tibia. A very efficient method of skeletal traction has been described by O'Donoghue[1]. He applies a pin or Kirschner wire through the upper end of the tibia and another through the os calcis. Traction is made on both wires, making more on the upper end of the tibia at first, and later more

Fig. 2. After relieving the contracture of the knee, traction was again applied and the dislocated hip was pulled down and reduced. During the two years it had been dislocated changes had taken place in the head of the femur, and the acetabulum had filled in, so that the head would not remain in the shallow acetabulum. A shelf operation was done, by turning down bone from the ilium over the edge of the acetabulum. This gave a stable hip. The photograph was made two years after the hip operation, and before a high tibia osteotomy was done to correct the remaining flexion deformity of the knee and outward torsion of the tibia.

Fig. 3. The six inches shortening on the right was compensated for by an artificial foot. Instead of a non-weight bearing stump as in an amputated leg, the patient was able to bear his weight on his own foot, standing on top of the wooden foot. His trousers concealed the entire apparatus. The patient walked without further support and with only a moderate limp. It is now ten years since the burn, and he is working regularly as a jeweler.

on the os calcis. This will correct most of the gross deformity.

In some cases, in addition to the knee flexion deformity, there is a great deal of lateral torsion of the tibia. This occurs in burns for the same reason that it does in poliomyelitis. The weight of the foot when unsupported rolls the lower leg outward, and gradually puts an outward twist in the tibia. In some of these cases it is necessary to do a tibia osteotomy to correct the outward torsion. If a high tibia osteotomy is done, any remaining flexion deformity can be corrected at the same time.

In addition to the knee flexion deformity, there may be other associated deformities. There is always an equinus deformity of the foot. One boy who had been allowed to keep his hip adducted for 18 months before admission had a dislocation of his hip. The hip was reduced after a long period in traction. There had been so much change in the head, and the acetabulum had filled in with fibrous tissue, so that the head would not stay in the acetabulum. It was necessary to do a shelf operation and turn down a bone flap from the ilium over the edge of the acetabulum to keep the hip reduced.

In some cases where the knee has been posteriorly dislocated for a long time, it cannot be completely reduced even though the knee is forced into extension. The patient continues to walk on crutches because of the pain in the knee. In these cases there is usually so little motion that it is of no real value. Such patients can be given a straight knee, free from pain by a knee fusion operation. A stiff straight knee does not cause much limp. This frees the patient of crutches and leaves his hands free for work.

In the cases where the leg has become short, the length of the legs might be equalized by shortening the well leg, or by lengthening the burned leg but both of these are major procedures. If the child is seen during the growing period, an epiphyseal arrest can be done on the well leg at the proper age, and the length of the two legs equalized. This is a relatively new procedure, but is giving very satisfactory results.

When the patient is too old for epiphyseal fusion, and does not want surgery, a cork lift can be placed under the shoe of the short leg, or a U shaped extension can be applied. A very satisfactory brace like prosthesis can be made for those with more shortening. This is like an artificial foot, but instead of a non-weight bearing stump, the patient stands on top of the cork foot, with his own foot pitched down in equinus (fig. 3). His trousers hide the apparatus, and he is able to walk better than most people do with an artificial foot.

SUMMARY

Patients with severe burns are emergencies and should be admitted to a hospital where there are surgeons skilled in skin grafting, so that the denuded area may be covered as promptly as possible and deformities prevented. In the cases seen after the deformities have occurred, the web of scar tissue should be removed and the area covered with split thickness skin grafts. Flexion deformities of the joint should be corrected by casts and wedgings, or by traction apparatus. Night splints should be worn to keep the knee joint in full extension. If the joint continues to be painful a knee fusion may be done. Shortening should be compensated for by epiphyseal arrests if patient is seen during the growth period. If seen later, an extension apparatus will equalize the length of the legs.

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A SURVEY OF 496 CASES OF VAGINAL BLEEDING

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INTRODUCTION

"DOCTOR, I have trouble with my menstruation." How frequently this complaint is brought to the attention of a physician, and yet, in many instances there is no systematic approach for the solving of this problem.

Abnormal vaginal bleeding is a symptom and not a disease. The intelligent investigation of this complaint* is of the utmost importance to the patient and to the physician. Such management will unquestionably be of value in discovering relatively early cases of pelvic malignancy.

Briefly, a few important facts to be kept in mind are:—

1. The occurrence of abnormal vaginal bleeding of both malignant and benign origin is not limited to any particular age groups.
2. A complaint of abnormal vaginal bleeding does not necessarily localize the causative factor to the internal genitalia.
3. Relief following symptomatic treatment does not always mean removal of the causative factor which may produce grave consequences at a later date.
4. The possibility that the bleeding may be due to more than one causative factor must not be ignored.
5. Routine use of endocrine products for abnormal vaginal bleeding without an accurate diagnosis having been made is only mentioned to be condemned.
6. A detailed history and a complete physical examination will, in most instances, enable the physician to arrive at a satisfactory working diagnosis.
7. The minimum laboratory work should include a complete blood count and urinalysis. Whenever indicated, additional laboratory studies should be obtained.
8. Frequently it is desirable to anesthetize the patient so as to permit a more thorough pelvic examination and at the same time to do a diagnostic curettage.
9. The importance of obtaining tissue for a microscopic diagnosis cannot be over-emphasized.
10. Once the diagnosis has been established the method of therapy must be carefully evaluated.

*A consideration of vaginal bleeding in conditions associated with pregnancy is beyond the scope of this paper.

Statistical Survey

During a ten-year period between 1930 and 1939 inclusive, a total of 5,250 cases were seen at a hospital whose work is restricted to the diagnosis and treatment of cancer and allied diseases. Of this number, 496 cases (9.45 per cent) came to the hospital complaining of abnormal vaginal bleeding. In some cases, there were several possible causes for the bleeding and in such instances the most probable cause was selected. A statistical survey in a hospital of this type necessarily shows a higher incidence of malignant disease as a causative factor in the production of this symptom than the figure obtained in a gynecologic clinic or in private practice.

Table 1

Age groups	Malignant neoplasms	Benign and unexplained causes	Total
40-49	22	14	36
50-59	72	31	103
60-69	62	20	82
70-	24	8	32
Total	180	73	253

Incidence of malignant and benign lesions as causes of postmenopausal bleeding.
Incidence of malignancy in postmenopausal bleeding.

Weintraub[1] reported a series of 738 cases of uterine bleeding in conditions other than pregnancy and found only 28 cases (3.7 per cent) of malignant neoplasms. In a series of 163 cases of menorrhagia and metrorrhagia encountered in office practice, Israel and Mazer[2] found only 5 cases (3 per cent) of carcinoma. In the latter investigation the curettements were performed in the office without the use of an anesthetic.

Abnormal vaginal bleeding can result from a variety of causes. The importance of this symptom varies with the age groups but of more importance is its relation to the menopause. The incidence of malignant and benign lesions as causes of postmenopausal bleeding is shown in Table 1. This table does not include two patients in the 30-39 age group who developed carcinoma of the cervix after a surgical menopause. One patient, a white woman of 37, had had a supracervical hysterectomy at the age of 35 for vaginal bleeding apparently due to fibromyomas. Recurrence of bleeding two years later resulted in the removal of a piece of tissue for biopsy and this was reported as adenocarcinoma arising in the glands of the cervix. The other, a white woman of 34, had had a bilateral oophorectomy at the age of 26. Recurrent bleeding eight years later was due to the presence of a squamous carcinoma of the cervix.

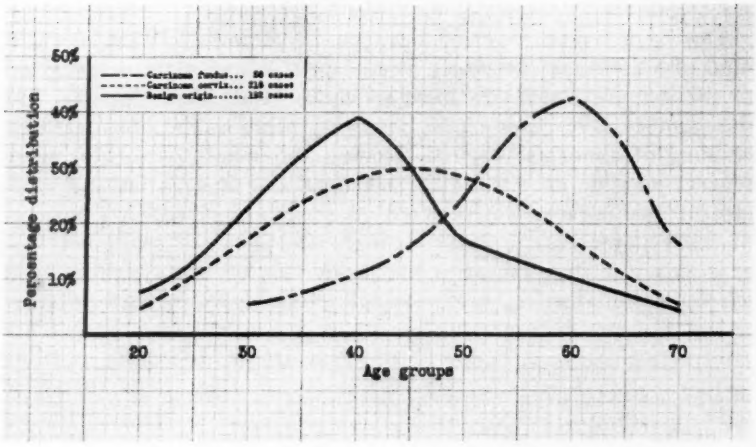


Fig. 1. Decade incidence of bleeding due to carcinoma of the cervix, carcinoma of the fundus and lesions of benign origin.

The decade incidence of carcinoma of the cervix, carcinoma of the fundus, and benign lesions in the production of abnormal vaginal bleeding is illustrated by a graph (fig. 1). This graph does not include the miscellaneous group of malignant neoplasms and the unexplained or functional group of cases.

I

Malignant Neoplasms

Malignant neoplasms, as causes of bleeding, occurred in 286 (57.7 per cent) of the entire series. There were 218 cases (44 per cent) of carcinoma of the cervix; 56 cases (11.3 per cent) of carcinoma of the fundus; and 12 cases (2.4 per cent) in a miscellaneous group of malignant neoplasms. Carcinoma of the cervix constituted 76.2 per cent of the malignant neoplasms; carcinoma of the fundus 19.6 per cent; and a miscellaneous group of cases made up the remaining 4.2 per cent.

In 255 (51.4 per cent) of the series of 496 cases the bleeding was postmenopausal. In this group of 255 cases, 182 (71.4 per cent) were associated with some form of cancer. Postmenopausal bleeding occurred in 56.9 per cent of the cases of carcinoma of the cervix; in 83.9 per cent of the cases of carcinoma of the fundus; and in 91.7 per cent of the remaining group of malignant neoplasms. Keene and Dunne[3] reported an incidence of 59.1 per cent of malignant lesions in 782 patients with postmenopausal bleeding. In a

series of 406 patients with postmenopausal bleeding analyzed by Taylor and Millen[4], there were 63.3 per cent in which the bleeding was due to malignant disease of the internal or external genitalia. Benthin[5] reviewed 244 cases of postmenopausal bleeding and found that in 54 per cent of the cases the bleeding was caused by malignant neoplasms.

TABLE 2

	Malignancy	Total Cases
Keene and Dunne	59.1%	782
Taylor and Millen	63.3%	406
Benthin	54.0%	244
Imler	71.4%	255

Incidence of malignancy in postmenopausal bleeding in four studies.

One half of the cases of carcinoma of the cervix occurred before the age of 50, while only 16.1 per cent of the cases of carcinoma of the fundus were present before the age of 50. In the entire group of malignant neoplasms, 41.6 per cent occurred before the age of 50.

The miscellaneous group of cases consists of 5 cases of carcinoma of the vagina; 2 of carcinoma of the ovary secondary in the uterus; 1 each of carcinoma of the thyroid, carcinoma of the bladder with secondary carcinoma of the vagina and cervix, carcinoma of the urethra, carcinoma of the rectum with secondary carcinoma of the uterine fundus, and reticulum cell sarcoma secondary in the uterus and probably primary in the jejunum.

A white female, age 53, with carcinoma of the thyroid was first seen in April, 1934. She gave a history of two previous operative procedures involving the thyroid gland. The most recent operation had been performed in 1929 at which time a histologic diagnosis of adenocarcinoma of the thyroid was made. The patient came to this hospital with the history of a recurrent mass in the neck and severe menorrhagia and metrorrhagia of eighteen months' duration. Pelvic examination and a diagnostic curettage did not reveal evidence of pelvic disease. A marked decrease in the vaginal bleeding followed the use of 1 grain of thyroid extract three times daily. Ovarian castration was then produced by high voltage roentgen therapy (1200 r to each of four pelvic ports) and this resulted in complete cessation of the bleeding. Roentgen therapy was then directed to the thyroid and this was later followed by surgical removal of the recurrent and metastatic areas of carcinoma in the neck. The vaginal bleeding was apparently caused by the endocrine imbalance, secondary to the extensive carcinomatous involvement of the thyroid gland.

The patient with the reticulum cell sarcoma, secondary in the uterus and probably primary in the jejunum, was 76 years old: she gave a history of severe vaginal bleeding over a period of four months prior to admission. She volunteered no other complaints except incontinence of urine. The patient's condition did not permit anything except palliative therapy and death ensued after three weeks' hospitalization. Autopsy disclosed extensive destruction of the cervix but histologic examination revealed the presence of a reticulum cell sarcoma probably primary in the jejunum with secondary sarcoma in the uterus, rectum, lungs, heart, pancreas and breast.

In the case of carcinoma of the bladder with secondary involvement of the vagina and cervix, frequency of urination preceded the onset of the vaginal bleeding by seven months. At no time did the patient have urinary bleeding. Clinically the site of the primary lesion was debatable. However, histologic examination of the tissue removed at autopsy established the neoplasm as primary in the urinary bladder.

The patient with the carcinoma of the rectum with secondary carcinoma of the uterine fundus gave a history of vaginal bleeding at 2 to 10 day intervals over a period of three months prior to her hospitalization. During this time, rectal bleeding occurred on only two occasions and this was very slight in amount. Pelvic examination disclosed the presence of a large fixed mass filling the pelvis. There was an area of induration and ulceration on the anterior wall of the rectum and continuous with the pelvic mass. The clinical diagnosis was carcinoma of the uterine fundus with extension into the anterior rectal wall. The histologic examination of the tissue removed from both the rectum and the uterine fundus established the lesion as primary in the rectum and secondary in the uterus.

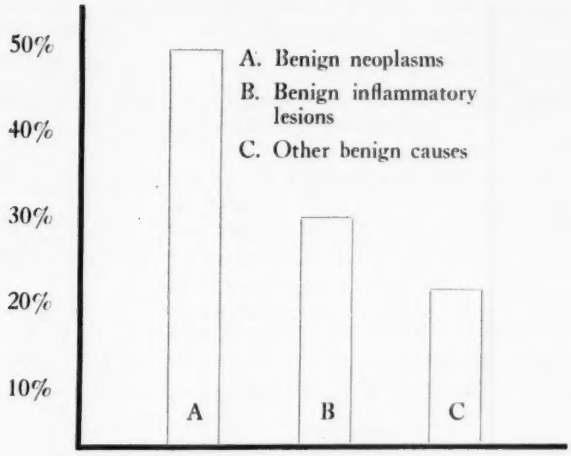
II

Bleeding of benign origin was present in 192 cases (38.7 per cent) of the series. Of the benign lesions, 65.6 per cent were premenopausal and 69.3 per cent occurred before the age of 50. These cases are grouped under (1) benign neoplasms, (2) benign inflammatory lesions, and (3) other benign causes. Table 3 depicts the percentage distribution of these various sub-groups.

Benign Neoplasms

This group of 93 cases constitutes 18.8 per cent of the series and almost 50 per cent of the entire benign group. In 64 instances, (68.8 per cent) the benign neoplasms occurred before the menopause

TABLE 3



Benign vaginal bleeding, 192 cases.

while only 36.4 per cent of the malignant neoplasms were present before the menopause. The 40-49 age group contained 43 per cent of the benign neoplasms. Table 4 illustrates the incidence of the various types of benign neoplasms.

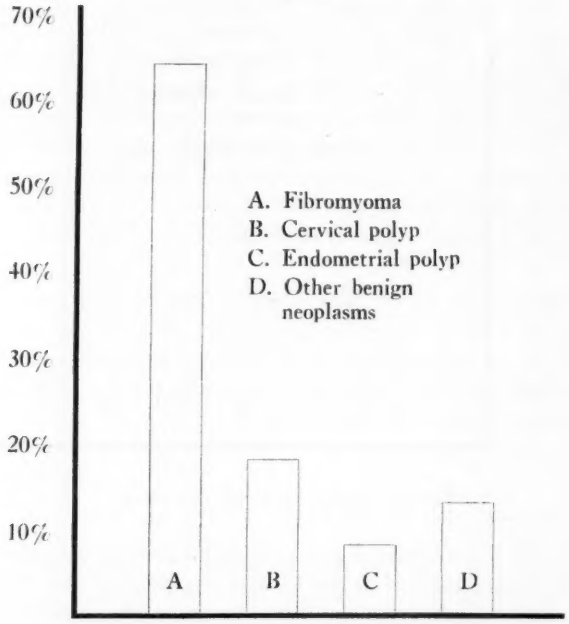
Uterine fibromyomas were the apparent cause of the vaginal bleeding in 59 cases. These represent 11.9 per cent of all the cases and 63.5 per cent of the benign neoplasms. Nearly 53 per cent of the fibromyomas were present in the 40-49 age group and the bleeding was premenopausal in 78 per cent of all the cases of uterine fibromyomas.

Cervical polyp was next in frequency in the production of abnormal vaginal bleeding. There was a total of 16 such cases which is 3.2 per cent of the entire series and 17.2 per cent of the benign neoplasms.

Endometrial polyp was the apparent causative factor in 7 cases and these represent 1.4 per cent of the series and 7.5 per cent of the benign neoplasms.

The remainder of the benign neoplasms are placed in a group that consists of 4 cases of ovarian cysts; 2 of endometriosis of the ovary; 2 of endometrioma of the uterus; 2 of urethral caruncle; and 1 endometrioma of the vaginal wall. This group of miscellaneous benign neoplasms is 2.2 per cent of all cases and 11.8 per cent of the benign neoplasms.

TABLE 4



Benign neoplasms with vaginal bleeding, 93 cases.

BENIGN INFLAMMATORY LESIONS

Benign inflammatory lesions were the apparent cause of the vaginal bleeding in 57 cases. These are 29.7 per cent of the group of benign lesions and 11.5 per cent of the entire series.

The most common type of inflammatory lesions was chronic cervicitis with erosion. It produced vaginal bleeding in 39 cases which are 7.9 per cent of all the cases and approximately one fifth of the entire benign group.

The other benign inflammatory lesions were uterine prolapse with erosion in 7 cases; endometritis in 6 cases; senile vaginitis in 3 cases; and pelvic inflammatory disease in 2 cases. This miscellaneous group of cases is 3.6 per cent of the series and 9.4 per cent of the benign lesions.

OTHER BENIGN CAUSES

Endometrial hyperplasia was the only finding in 29 cases. This group of cases is 5.8 per cent of the series and 15.1 per cent of the benign group.

Pregnancy and abortion appeared in 9 cases. These are divided into 7 cases of incomplete abortion; 1 uterine pregnancy; and 1 tubal pregnancy. These are 1.8 per cent of all cases and 4.7 per cent of the benign group.

Hypertension was the only demonstrable finding in 4 cases and makes up less than 1 per cent of all the cases.

Unexplained or Functional

In 18 cases it was impossible to find any specific cause for the abnormal vaginal bleeding. These make up 3.6 per cent of the entire series.

Summary and Conclusions

1. Among 5,250 cases seen at a hospital for neoplastic disease, 496 (9.45 per cent) complained of some form of abnormal vaginal bleeding.

2. In 57.7 per cent of all the cases, the bleeding was due to malignant neoplasms of which carcinoma of the cervix constituted 44 per cent, (218 cases).

3. In 255 cases of postmenopausal bleeding 71.4 per cent were associated with some form of cancer.

4. Nearly two-thirds of the cases of bleeding of benign origin occurred before the menopause.

5. In 3.6 per cent of the cases no definite causative factor could be ascertained.

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A MORE EFFECTIVE SURGICAL MASK

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CONSIDERABLE attention has been directed towards the elimination of droplets from the expired air of members of an operating team in an attempt to decrease the incidence of wound infections. It is quite likely that the majority of the bacteria implanted singly into an operative wound are overcome by the host and cause no further trouble. If, however, a considerable number

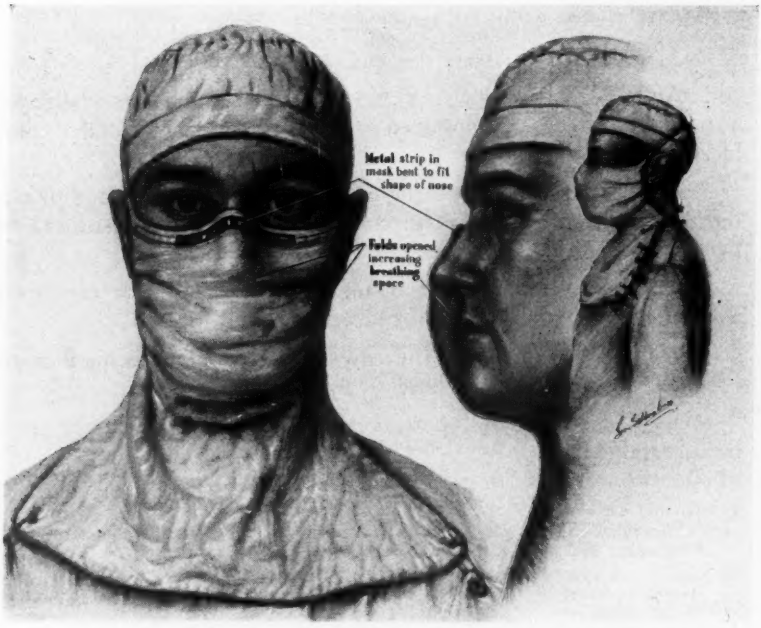

Fig. 1. Illustrates the general design of the bib-mask and the manner in which it is worn. The upper tie is made sufficiently secure to give the tightness desired over the nose by the aluminum strip which is formed to fit the conformity of the nose and face. The lower tie is loosely secured. The corners of the mask are attached to the shirt by safety pins to keep it in position underneath the operating gown.

of organisms are introduced to give a larger inoculum or are accompanied by some foreign material, the protective agencies of the body may not be sufficient to eliminate a moderately virulent pathogenic bacterial implant.

From the Surgical Hunterian Laboratory, Department of Surgery, Johns Hopkins University School of Medicine, Baltimore.

The natural oiliness of the skin of individuals varies considerably, and the amount of exfoliation of small particles varies with the dryness of the skin. Little attention has been given these small particles which may literally rain off the bottom edge of the usual mask when worn by an individual with a dry, exfoliative type of skin. This shower of particles is readily demonstrated by exposing bacteriologic plates in an area to correspond with the operative field. These particles carry many bacteria and can readily act as a nidus for the development of a suppurative process. In an attempt to eliminate this source of contamination a mask has been designed

Fig. 2. Illustrates the manner in which the mask is worn with the bib extending underneath the sterile operating gown and contrasts the coverage afforded by the conventional type of mask.

with an attached bib which extends underneath the sterile operating gown and directs the exfoliative particles away from the operative field.

The mask is designed with several folds and pleats so as to give it a fullness over the mouth and chin. This fullness makes it a comfortable mask to wear and gives a large breathing space. This increased breathing space allows air to filter through the mask over a large area and reduces the streaming of the expired air which tends to carry droplets through the material of the mask if the air

is transmitted at a relatively high speed. Further protection against the usual oral spray can be had by wearing a small mask just covering the mouth underneath the larger bib-type mask. The aluminum strip incorporated in the upper edge of the mask fits the mask closely to the nose to eliminate fogging of the operator's spectacle lenses.

Attention should be directed to the fact that a degree of masking suitable and safe for one individual may be entirely inadequate for another, because of the difference in the breathing habits and because of the variation in the efficiency of the nasal passages as a filtering apparatus for the removal of particles from the respired air. A dry skin should be anointed with cold cream and the hair of the eye brows should be treated with mineral oil to give additional protection.

CARCINOMA OF THE OVARY

H. R. Shands, M. D.
and
R. Lee Clark, Jr., M. D.
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OVARIAN tumors are one of the frequent neoplastic conditions encountered in the practice of medicine. Certainly everyone who includes abdominal surgery in his repertoire should have a working knowledge of the benign and malignant conditions encountered in the ovary. It is our purpose to present the experience obtained from a general surgical practice as regards the incidence of ovarian malignancies with especial emphasis on the age distribution. Only our private patients operated on at the Mississippi Baptist Hospital in the past seventeen years are included in this paper. The patients treated for ovarian tumor in the Mississippi Charity Hospital and in out-of-town consultations by us could not be included because of inadequate records. A few simple and pertinent rules will be formulated from these studies, which we believe will dictate the advice to be given to an individual patient as regards her subsequent treatment. The classification of ovarian tumors used by Cutler and Buschke is concise and inclusive and is adequate for a surgical review of ovarian neoplasms (table 1).

The incidence of occurrence of malignancies in any group of ovarian neoplasms varies widely. However, it is very high and increases greatly with each decade of life beyond thirty years. Lynch[2] in a group of 302 ovarian neoplasms found 110, or 30 per cent, to be carcinomatous in nature. May[3] found, in a review of the literature, that malignant degeneration of ovarian tumors varied in the reports of the different authors from 11.7 to 24.5 per cent, while the average was 20.0 per cent. That is, that one out of every five cases of ovarian tumors was malignant.

Counseller, in discussing the age distribution of patients with ovarian malignancies, stated that it was uncommon to find a carcinoma of the ovary in a woman less than 35 years of age; this being a malady chiefly of the fifth decade of life, and beyond. In our series, the patient's age, by decades in which they occurred, of both benign and malignant lesions, are recorded in table 2.

In our group of 250 patients with ovarian neoplasms, 29, or 11.6 per cent, had growths that were carcinomatous in nature. The remaining 221 patients were found to have benign cystic neoplasms

Read before the Twelfth Postgraduate Surgical Assembly of the Southeastern Surgical Congress, Richmond, March 10, 11 and 12, 1941.

TABLE 1

Classification of Ovarian Tumors

	Benign	Malignant
A. Nonproliferating ...	Follicle cyst Corpus luteum cyst	
B. Proliferating tumors I. Epithelial tumors	Pseudomucinous cystoma Papillary serous cystoma	Pseudomucinous cystocarcinoma Papillary serous cystocarcinoma Solid carcinoma Special solid types: Granulosa cell Arrhenoblastoma Seminoma
II. Embryonal tumors	Dermoid cyst (cystic) Teratoma (solid)	Teratoma Chorionepithelioma
III. Implantation tumors	Endometrioma (chocolate cyst)	Secondary adenocarcinoma of the gastrointestinal tract. (Krukenberg tumor) Adenocarcinoma secondary to primary carcinoma of the genital tract.
IV. Connective tissue tumors	Fibroma Fibromyoma	Sarcoma Endothelioma Perithelioma

of the ovary. This figure coincides closely with that reported by Bell and Datnow[4] since they encountered 12 per cent malignant changes in 232 cases of cystadenoma.

The significant increase in the percentage of tumors that are malignant in the 40 and 50 year groups may be noted in table 3. An ovarian tumor encountered while examining a woman whose age is over 40 years has one chance in three of being malignant. If the patient is over 50 years of age we have found the tumor to be carcinomatous in two out of three instances. In no other group of malignant tumors is a more gratifying result to be obtained, when an early diagnosis is made and proper therapy instituted. Therefore, it would appear logical to suggest that every woman beyond 40 years of age should have a yearly pelvic examination by her family physician or a gynecologist.

It will be noted (table 2) that cancer of the ovary does exist in the earlier decades of life. It behooves us, therefore, to investigate by laparotomy all ovarian tumors found during examination of a patient, regardless of her age. A period of observation preceding such an investigation may be fraught with danger to the patient and bring regrets to the surgeon, and it is to be absolutely condemned if the patient in question has attained or passed her fortieth year.

TABLE 2

250 Ovarian Neoplasms

Age Groups	Benign Cystomas		Malignant Tumors	
	Number	Per Cent	Number	Per Cent
1 - 19	15	94.0	1	6.0
20 - 29	97	98.8	1	1.2
30 - 39	65	95.1	3	4.9
40 - 49	36	85.7	6	14.3
50 - 59	5	35.5	9	64.5
60 - 69	2	25.0	6	75.0
70 - 79	1	33.3	2	66.6
80 - 89		0	1	100%
Totals	221	88.4	2.9	11.6

Treatment of carcinoma of the ovary should consist of radical surgery whenever possible. Roentgen ray and radium therapy should be utilized as an adjuvant as the particular condition encountered dictates. Given a particular patient, 40 years of age or older, with an ovarian tumor, the procedure for her management under our care is:

1. To recommend immediate surgical exploration.
2. If a tumor of the ovary is encountered:
   a. Ovary is removed unruptured and pathologist's report requested immediately.
   b. Benign lesion, surgical procedure to be such as indicated.
3. If a malignant neoplasm confined to ovary is encountered:
   a. Removal of all pelvic organs is the procedure of choice, even in the 50 per cent of patients in which the lesion is unilateral.
   b. Irradiation is used following surgery in those instances in which the carcinoma is a grade 3 or 4 by Broders'[6] classification.
4. If a malignant neoplasm originating in the ovary but disseminated, is encountered and if the patient's condition permits:
   a. The primary site of the carcinoma is removed along with as much of the remainder of the pelvic viscera as is possible.
   b. Extensive irradiation is carried out following surgery in all instances.

5. If malignant neoplasm of the ovary that is totally inoperable is encountered radiation therapy is given unless the patient is cachetic.

There are certain types of ovarian carcinoma that one is inclined to treat with conservative surgery in an attempt to conserve the reproductive function in the patient below 40 years of age. These are tumors having a low grade of malignancy and occurring unilaterally. As a rule, these are the grade 1 cystic pseudomucinous carcinoma, the granulosa cell tumor, the arrhenoblastoma and the dysgerminoma. The latter occur very rarely. If simple excision of

TABLE 3

Age Incidence
Ovarian Malignancies

Age Groups	Benign Cystomas	Malignant Neoplasms	Per Cent of Malignancies
Under 40 Years	177	5	2.7
Between 40-50 Years	36	6	14.3
Over 50 Years	8	18	69.1

the involved ovary is decided upon, the other ovary must be carefully inspected to make certain that a similar process has not already begun.

The result of treatment of course depends upon the degree of advancement of the lesion at the time of surgery. Counseller[7] reports a series of 143 patients treated at the Mayo Clinic with surgical procedure alone; 65.4 per cent of them were living five or more years after treatment. One hundred eighteen patients received intensive irradiation in addition to surgical treatment and of this number 50.5 per cent were living five or more years later. Thirty-six patients had extensive lesions and were suitable for irradiation only; 16.7 per cent of them lived five years or more after such treatment.

Meigs, reporting the experience at the Massachusetts General Hospital with 147 patients suffering from carcinoma of the ovary, was able to find only 24, or 16 per cent, living for five years after treatment and without demonstrable malignancy. However, there were many patients with inoperable lesions in this series.

For the hopelessly inoperable condition encountered in some patients, radiation therapy is justifiably indicated to decrease the formation of ascitic fluid and reduce pain. Also, some form of hope must be given the patient and her relatives if they are to be guarded from the quack and the fraud. Certainly the last word has not been written regarding the treatment of cancer, so it behooves us to try every logical means at our disposal. Sometimes a surprising result will be obtained in a seemingly hopeless case. Neill[8] reporting a group of 126 patients with far advanced carcinoma of the ovary that were treated by radiation therapy alone, found three patients apparently cured, one for 2½ years, one for 6, and one for 10 years. An experience of our own with such a patient is encouraging to review:

Case Report

Miss M. S., aged 40, gave as her presenting symptom a palpable tumor of the lower abdomen. On Feb. 9, 1936, the abdomen was explored through a low midline incision. A large cystic, grade 4, adenocarcinoma of the left ovary had become adherent to the adjacent pelvic viscera and pelvic wall, due to carcinomatous perforation and infiltration. As much of the tumor was removed as possible, but complete removal was out of the question as the whole left pelvis was studded with adherent malignant tissue. It was considered useless to remove the remaining pelvic viscera, but 50 mg. of radium was placed in the midst of the remaining carcinoma as a last resort. It was screened by a hard rubber tube and the intestines were protected by vaseline gauze. Both radium and gauze were removed in 24 hours. Postoperatively maximum doses of Roentgen therapy were administered. A gain in weight of approximately 30 pounds and a steady return to normal health has been her subsequent course. A recent physical examination given during her five-year follow-up shows no evidence whatsoever of any continuation or recurrence of the original malignant process.

Conclusions

1. A marked increase in the number of ovarian neoplasms that are malignant is noted in patients past 40 years of age. An annual examination of all women in this age group is advocated for early diagnosis and curative therapy.

2. Immediate operative investigation of the exact nature of any ovarian tumor is urged.

3. Removal of the primary, unruptured neoplasm is paramount. Its removal, regardless of the extent of the lesion, is a desired procedure when possible.

4. A pathologic interpretation before closure of the abdomen is essential for proper treatment.

5. The patient is entitled to a conscientious use of all available methods of therapy.

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OSTEITIS FIBROSA CYSTICA

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Mobile

AS LONG ago as 1891 von Recklinghausen described a chronic inflammatory disease of the bones that he termed osteitis fibrosa cystica. In 1904 Askansky noted the relationship of this disease to overactivity of the parathyroid glands, either as hyperplasia or as tumor formation. In 1907 Erdman[1] pointed out that parathyroid hyperplasia was common in this disease and in osteomalacia.

Baetjer[2] stated that the disease, though usually classed with tumor, is probably of inflammatory origin and that it is of the first age period with involvement mainly of the femurs and tibias. Our modern and more accurate knowledge of this disease is due to the work published in 1931 by Donald Hunter.[3]

Radiographically the disease is characterized by generalized decalcification and rarefaction of the bones with the formation of multiple spaces. The bony cortex is expanded and thinned to egg-shell-like proportions, but remains intact. Frequently there occur in conjunction with this disease benign giant cell tumors, areas of cystic formation with trabeculation within the cyst space. Spontaneous fractures with but minimum trauma frequently occur through these areas of cystic degeneration. These fractures heal with remarkable readiness. The bones more frequently involved are, in the order named: femur, tibia, jaw, skull, and the bones of the trunk. Because of the altered calcium metabolism there is an altered calcium balance and much is excreted in the urine. Some calcium may be deposited in the kidney so that renal calculus formation is of frequent occurrence. At times calcium is deposited in the walls of the arteries as a metastatic calcification.

The biochemical changes are striking and significant. The blood calcium rises to from 12.0 to 15.0 mg. per 100 c.c. of blood, and there is a corresponding decrease in the blood phosphorus to from 1.5 to 2.5 mg. per 100 c.c. of blood. The plasma phosphatase, an enzyme produced by the osteoplast and concerned with bone formation, is also elevated. This alteration in calcium metabolism has been shown to be due to hyperactivity of one or all of the parathyroid glands, for these same bony changes can be produced by continued feeding of parathyroid extract.

This case is accession number 70412 of the A. S. C. P. Tumor Registry in the Army Medical Museum and was presented in the Tumor Seminar at Cleveland, Ohio, in June, 1941. I wish to express my appreciation to Col. J. E. Ash for the reproductions of the x-ray films in this case.

Microscopically the osseous structure shows a replacement of the medullary tissue by a new fibrous tissue, with or without cyst formation. There is a growth of new vascular tissue and absorption of bone. Microscopically giant cells are frequently found in the walls of the cysts and in the new fibrous tissue, or gross giant cell tumors may be present. The microscopic structure of the parathyroid adenoma closely resembles the structure of the normal gland. The

Fig. 1. Lateral view of skull.
(U. S. Army Medical Museum Neg. No. 70861)

cells are compact, arranged in columns or, occasionally, in acinus formation. There is an increased vascularity with the presence of many thin-walled blood vessels. Groups of large cells are present having a dense cell border, hyperchromatic nuclei and vacuolated cytoplasm. There are also cells present that give strong acidophilic reaction. Occasionally there are found small acini filled with colloid closely resembling thyroid structure and the entire process is one of a generalized hyperplasia of involved gland. Upon removal of the adenomatous glands there is a rapid fall in blood calcium. In some cases there may be symptoms of tetany due to the rapid fall and it may be necessary to administer calcium. The general condition of the patient after removal of the gland often improves so

remarkably that patients have been known to throw away their crutches.

Report of Case

A colored man, 27 years of age, had noticed a swelling and enlargement of the left thigh 18 months prior to admission. Then, in succession, he had noted an enlargement of the right thigh, a large firm knot appeared on his head and at the symphysis of the mandible. The right shoulder became so large that use of that arm was almost impossible. Six months before admission he had noted swelling of the left wrist. Since that time he had lost 15 pounds and had experienced dyspnea. After only slight trauma, there occurred a fracture

Fig. 2. Anteroposterior view of shoulder.
(U. S. Army Medical Museum Neg. No. 70855)

of the left femur which promptly healed with slight disability. There was no history of fracture of the right femur.

Upon physical examination there was noted a hard, bony prominence on the right side of the forehead, as well as one at the symphysis of the mandible. The right shoulder showed an irregular enlargement so that the upper arm was larger than the thigh. A hard mass was palpable in the distal end of the left ulna. Both hips showed limited motion and there was an apparent external bowing of the femurs. The thorax presented various areas of bony enlargement of the ribs.

The heart was enlarged to the left and a murmur was present at the apex. The neck presented no asymmetry of the thyroid and no masses or adenopathy.

Urinalysis and blood cells showed no variation from the normal. Blood calcium was 10 mg. per 100 c.c. of blood on two examinations. Phosphorus was 2.3 mg. B. M. R. was + 14; sputum and feces examinations were negative. Blood Wassermann, Kahn and Johns were negative.

X-ray findings: Lateral view of the skull (fig. 1) presented four areas of decalcification and cystic formation in the vault. A rounded bony growth with cyst formation was present in the left frontal region. Areas of bony decalcification and cystic formation were present at the symphysis of the mandible on the right. Examination of the shoulder (fig. 2) showed an extensive expansion of the cortex of the humerus which was thinned to paper-like consistency. An extensive cystic degeneration was noted in the head and neck of the humerus,

Fig. 3. Anteroposterior and lateral views of wrist.
(U. S. Army Medical Museum Neg. No. 70860)

as well as in the upper end of the shaft. Cystic degeneration was seen in the scapula and rarefaction with expansion of the cortex was noted in the outer end of the clavicle. The left wrist (fig. 3) showed symmetrical enlargement of the lower end of the ulna with trabeculation within the cyst space. On the medial and proximal side of the cyst there was an apparent destruction of the cortex with some evidence of proliferation into the soft parts which suggested a malignant change in the benign giant cell tumor. Examination of the thorax demonstrated multiple areas of cystic degeneration with expansion of the cortex of many of the ribs, and examination of the lumbar spine and pelvis demonstrated a calculus in the right renal area. The bodies of the lumbar vertebrae were apparently uninvolved, but all of the bones of the pelvis, as well as the upper ends of both femurs, presented this same cystic degeneration. There was an old healed fracture of both femurs in a subtrochanteric area.

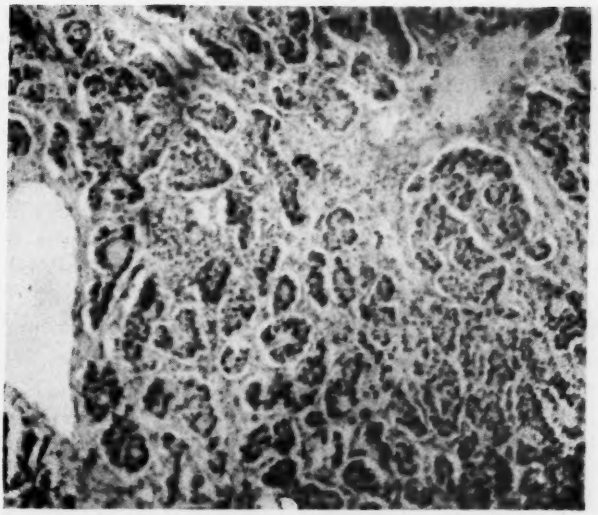

Fig. 4. Photomicrograph of parathyroid adenoma.

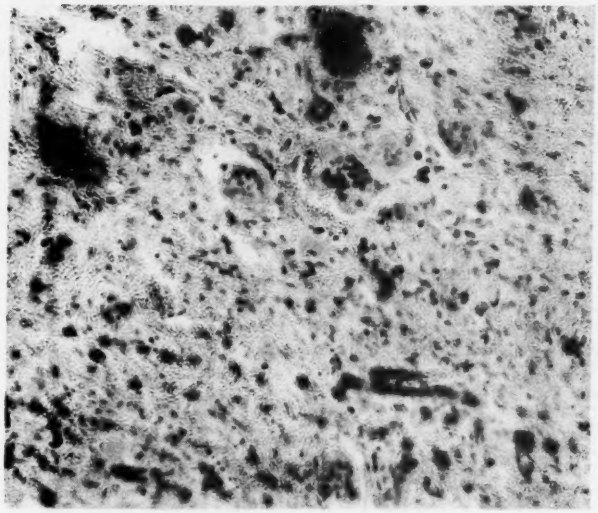

Fig. 5. Photomicrograph of giant cell tumor of wrist.

At operation a pedunculated mass 4.0 by 2.5 by 1.2 cm. was found arising from the inferior parathyroid gland. On section it was reddish brown and solid throughout, of the consistency of brain tissue and showed no evidence of hemorrhage or cyst formation. The microscopic picture (fig. 4) was one of a generalized hyperplasia of the parathyroid gland.

Follow-Up Notes: Approximately four months after operation the patient returned for observation, stating that his general health was very much improved, and that he seemingly could walk much better than formerly, even though he still used his crutches. He also stated that there was much more mobility in the shoulder than there had been previously. At this time the blood calcium was 8 mg. per 100 c.c. of blood, and the blood phosphorus had risen to 3.2 mg. per 100 c.c. of blood, which is within normal limits. He consented to a biopsy of the tumor of the left wrist. Grossly this tissue resembled mulberry jelly. The tumor was exceedingly vascular and hemorrhage was controlled only by packing.

Microscopic sections (fig. 5) revealed a typical giant cell tumor of bone and the tissue was composed of a rather dense interlacing structure of the spindle cells containing numerous multinucleated giant cells having their nuclei centrally placed.

About three months after biopsy of the forearm, x-ray of the left wrist showed a partial filling in in the region of the bone cyst of the ulna. The cortex was much thicker and there had been no new areas of cystic degeneration. Reexamination of the shoulder showed a similar thickening of the cortex of the bone which appeared much firmer in character. There was apparently no reduction in the size of the mass.

The patient's general condition was much improved and he stated that he had been able to walk with much less difficulty and had gained about 15 pounds in weight.

SUMMARY

A case of osteitis fibrosa cystica, associated with an adenoma of the parathyroid gland and a benign giant cell tumor of the left wrist, as well as a left renal calculus, is herewith presented.

After removal of the adenoma there was a general improvement in the patient's condition, along with a return to normal of blood calcium and phosphorus.

Blood phosphatase studies were not made in this case.

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TUBERCULOSIS OF THE BREAST

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FIRST recognized as a clinical entity by Sir Astley Cooper[1] in 1829, who described it as a "scrofulous swelling of the bosom," tuberculosis of the breast continues to be a relatively infrequent lesion (0.54 to 1.87 per cent of all breast lesions). Since, however, its recognition relieves the patient of more radical treatment, it seems well to bring the subject to the attention of the profession occasionally, and to report additional cases. Many cases are practically indistinguishable from carcinoma, so that it must be constantly borne in mind if a correct differential diagnosis is to be made. The fact that five of the seven cases herewith reported were recognized during the past eighteen months, and only two had been diagnosed during the preceding fourteen years, would indicate that many go unrecognized. Smears should be made from all purulent discharges from the nipple and from the pus in atypical abscesses, for the walls of these do not always show histologic evidence of tuberculosis. In our sixth case (Mrs. T. M. P.), for instance, it seems reasonable to hypothesize, now, that the original abscess, excised over eight years ago from the other breast, was possibly tuberculous, though a review of the tissue removed at that time fails to show giant cells, or tubercle formation. If, as shown by Webster's[10] study, a total of only approximately 500 cases had been reported in September, 1939—an average of about five a year since Cooper's work—it is obvious no one individual can report an extensive series; hence, this review of the subject, and report of seven additional cases, including one of apparently bilateral occurrence.

Of the 1,291 breast lesions examined at The Steiner Cancer Hospital, prior to Nov. 15, 1940, there were found 581 malignant lesions, and seven definite cases of tuberculosis of the breast. There were three other cases which might have been included, but one, while removed from the periphery of the breast, showed a tuberculous adenitis and no mammary tissue; a second had had a lesion removed in another city, and it was not certain that the slides sent to Steiner had come from her breast; and the third was not sufficiently typical to be classed as tuberculosis.

From the Surgical Service, Steiner Cancer Hospital, Atlanta.

The assistance of Dr. E. L. Bishop in reviewing the tissues and slides is acknowledged.

Read before the Fifty-third Annual Session, Southern Surgical Association; Hot Springs, Va., Dec. 10, 11 and 12, 1940.

Thirty years after Cooper's description, Lancereaux [2] based the diagnosis on the microscopic picture. In 1868 Cuneo (according to Morgen[3]) described a case in a male; he isolated the organism from the pus, and obtained positive results from animal inoculation. Deaver and others have said that Dubar[4] (1881) first established the diagnosis on both a microscopic and bacteriologic basis.

(The authors cannot reconcile the fact that Koch did not describe the tubercle bacillus until 1882 with the statement often made in the literature of tuberculosis of the breast that Cuneo and Dubar recognized the bacillus earlier.)

The literature since Dubar has been reviewed by Anspach[5], Deaver[6], Barker[7], Morgen[3], Lee and Floyd[8], Keeley[9], and Webster[10].

Compared with the thousands of cases of tuberculosis of other organs reported annually, this paltry group of cases emphasizes its rarity—and even in lesions of the breast it is very infrequent. As shown by the various series—Deaver and McFarland[11] 0.83 per cent; Keeley[9] 0.83 per cent; McGehee and Schmeisser[12] 1.87 per cent; Grimes and Massie[13] 1.4 per cent; and this series 0.54 per cent —an average of one in every hundred cases. Compared with carcinoma of the breast, Harrington[14] finds it occurring once in every two hundred cases.

Though such a distinction is of little practical importance, tuberculous mastitides are generally classified as primary and secondary. Berger and Mandelbaum[15] stated: "In the primary type the disease is confined to one breast, with or without involvement of the axillary nodes on the same side and without clinical evidence of active tuberculosis elsewhere. In the secondary type, there are manifestations of active tuberculosis in other organs, especially in the lungs, pleura and ribs." In Morgen's[3] review, he found about 7 cases in 10 were primary, though others, notably Klebs and Ribbert, (quoted by Deaver and McFarland[11]) denied the occurrence of primary mammary tuberculosis, believing that other organs would be found involved. Morgen agreed with this view since in no case, at necropsy, had tuberculosis been limited to the mammary gland; absolute proof of primary mammary tuberculosis is still lacking. Hudgins[16] expressed the opinion that, with modern improved means of diagnosis, other foci would have been found in many of the reported primary cases. However, he emphasized that treatment is more important than the classification as primary or secondary, as it would be the same in either instance, depending upon the activity or extent of the lesion, and not upon the existence or nonexistence of another focus.

The causative organism is, of course, the tubercle bacillus, usually of the bovine type, which may gain entrance in one of several ways:

1. Through the ducts.
2. Through abrasions of the surface of the nipple or skin.
3. Through the blood stream.
4. Through the lymphatics.
5. Through contiguity of tissue.

Since such a large percentage of the reported cases have been married women who have nursed children, the first two groups seem quite reasonable possibilities. As to the third group, Nagaskima, in autopsies on 34 cases of miliary tuberculosis, found the breasts to be the only organs not involved, thus indicating the blood stream as an unlikely portal of entry. While it seems to be generally agreed that the most common mode of infection is a retrograde involvement through the lymphatics, the following case from Steiner is reported as evidence against this assumption—certainly if any case occurs from retrograde involvement this one would have, but she has now gone over 11 years without evidence of tuberculous involvement:

Mrs. M. F., aged 25, was admitted to the Steiner Cancer Hospital, May 24, 1929, with a history of successive enlargement of the postauricular, supraclavicular, infraclavicular, and anterior axillary lymph nodes on the left side, over a period of approximately 18 months prior to admission. She had had no cough, fever, or other symptoms.

Past history was irrelevant except for one miscarriage at about 3 months, approximately four or five years previously.

Family History.—One paternal aunt died of cancer of the breast. There was no history of tuberculosis.

Examination revealed enlarged, hard, discrete, freely movable nodes in the postauricular, supraclavicular, infraclavicular, and anterior axillary groups on the left side. The left breast was stated to be enlarged about 30 per cent, presumably due to lymph stasis. No masses were felt in the breast.

Laboratory Data.—Red cell count 4,090,000, with 79 per cent hemoglobin; white cells 6,500, with 64 per cent polymorphonuclears. Urinalysis negative except for faint trace of albumin. Blood Wassermann was negative. Roentgenograms of chest showed trunk thickening and peripheral infiltration in the right first interspace suggestive of early tuberculosis, but the roentgenologist stated that this diagnosis was not justifiable on roentgenologic evidence alone. Examination repeated on Jan. 5, 1931, showed no change in the appearance of the lungs, indicating that the pulmonary lesion was quiescent.

Pathologic report on a node removed from neck, July 6, 1929. "Sections showed mostly a broad area of necrosis with very little of the node left, only a narrow area just beneath the capsule. No giant cells were seen and no tubercle formation, for the destruction had been no marked."

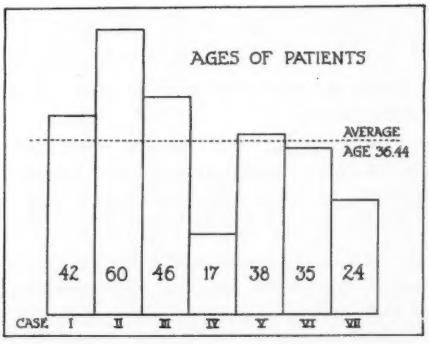
Clinical Diagnosis.—Probable tuberculosis. (Other nodes which had been removed, May 24, 1929, were too necrotic to attempt a diagnosis.)

Therapy consisted of general hygienic measures, bismuth salicylate intramuscularly, and roentgenotherapy over enlarged nodes and over breast. Con-

dition improved under this therapy and, on April 27, 1931, the breasts were reported as being about the same size. At this time, nodes were present in both cervical regions and in the left axilla. Another cycle of deep therapy was given. She was not seen again until Jan. 19, 1940, when she appeared to be in good general condition, weighing 137 lbs. She said she had weighed as much as 148 lbs. (a gain of 29 pounds) but had reduced by diet and exercise. No enlarged nodes were felt, and the breasts showed no evidence of disease except that the left breast was slightly larger than the right.

On Nov. 29, 1940, her weight was 136. No nodes were palpable in either supraclavicular space or axilla. The left breast was slightly larger than the right, and both were free of disease, but for a globular mass about 2 cm. in diameter in the upper portion, or perhaps outside the breast tissue on left side. This mass was smooth, not tender, and freely movable on the deeper structures and under the skin. It felt like an enlarged lymph node.

Comment.—The fact that this patient had definitely proven tuberculosis of the cervical nodes on the left side, enlargement of the axillary nodes on the same side, presumably tuberculous, and edema and 30 per cent enlargement of the left breast, certainly presented ideal conditions for a retrograde lymphatic involvement. It is true that the cervical and axillary adenitis cleared up following roentgenotherapy, and that she also had this therapy over the breast. It will be interesting to find the nature of the present lump, over which she will have roentgenotherapy and later excision, if it persists.

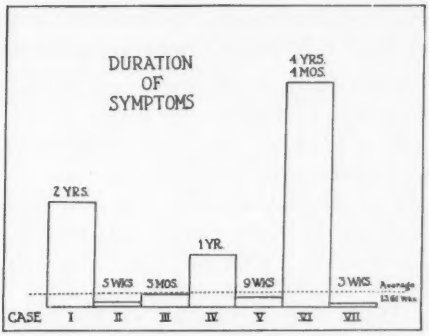


Trauma is reported among the predisposing factors in only 7 per cent of cases. Sex seems very important, since Berger and Mandelbaum[15] could find only 24 cases occurring in males. The child-bearing age (20 to 50) was the most common age period (this series averaging 36.44 years). Over 75 per cent of Morgen's cases had been married, and 50 per cent had borne children.

Symptomatology

In the primary cases the clinical history is not characteristic. In the secondary cases, if tuberculosis exists elsewhere in the body,

one should suspect the nature of the breast lesion. A painless lump is the first thing noticed by the patient in approximately 70 per cent of the cases. As in carcinoma of the breast, pain appears to be the initial symptom in only about 8 per cent of the cases, and is usually regarded as a late manifestation of the disease. Of the other initial symptoms, enlarged axillary nodes, discharge from the nipple, spontaneous rupture of an abscess with sinus formation, or hardening of the breast are the most frequent. In some cases, in which the initial symptom was a lump, this has gone on to abscess formation, with rupture and sinus formation. Sinuses or fistulas are said to be present in approximately 30 per cent of the cases.



Naturally, the physical findings vary greatly according to the stage of the disease, and whether or not a secondary infection is superimposed, or there is a concomitant malignancy. One may find an isolated mass, suggesting a soft adenofibroma, or, if near the surface, a cyst. If the skin is involved it is usually flattened, red and puckered, simulating so closely the findings in malignancy that in this type the correct differential diagnosis can rarely be made. A tuberculous lump may not be as freely movable in the breast, and the edema of the surrounding tissues may further complicate the diagnosis. If an abscess forms it will sooner or later rupture, and the presence of a sinus makes the diagnosis easier, though it may be necessary to take a biopsy to rule out a malignant sinus. The lesion is nearly always unilateral. Only 14 cases of bilateral involvement could be found up to the present time. In about 50 per cent of the primary cases, and nearly all the secondary cases, enlarged axillary and sometimes supraclavicular and even cervical nodes can be felt. The nodes may also progress to suppuration and spontaneous drainage. If present, postoperative radiation should be instituted.

Diagnosis

It is said malignancy is diagnosed in over 50 per cent of the cases, but in this small group the correct diagnosis was made in all but one case, and in that one the true nature was suspected after she had received a preoperative cycle of roentgenotherapy, but before operation, so that a simple rather than a radical mastectomy was performed. To mistake tuberculous mastitis for carcinoma is not to be considered a serious error. It is, however, highly desirable to make the correct diagnosis, since the patient can, thereby, be saved an unnecessarily mutilating radical operation.

The diagnosis is especially difficult before the stage of sinus formation. When only a lump is present, carcinoma, sarcoma, benign fibro-epithelial tumors, chronic cystic mastitis, gumma, plasma cell mastitis, and fatty necrosis of the breast must be ruled out.

Of these, carcinoma is the most important. In the discrete nodular type of tuberculosis of the breast, which is the most common type, there is often a painless mass, with fixation of the overlying skin and associated adenopathy, and such cases are usually diagnosed as cancer. If only tuberculous mastitis is kept in mind as a possible cause of these findings, there are certain features which may arouse suspicion of the condition. It usually occurs in relatively younger individuals, and the tumor increases in size more rapidly than a carcinoma. The absence of metastases in the presence of a large breast tumor is also suggestive. Some of the tuberculous tumors are rather large when the patient first presents herself for examination. If a tumor of such a size were malignant, one would expect to be able to demonstrate extensive metastases roentgenologically and by other examinations. Retraction of the nipple is more frequent with carcinoma than with tuberculosis. Discharge from the nipple is more frequent in tuberculosis than in carcinoma, and the discharge of a tuberculous lesion is more often purulent, whereas that of a carcinoma is more likely to be serous or bloody. Differentiation between the sclerosing type of tuberculous mastitis and scirrhous carcinoma may be impossible even after the breast is removed and sectioned grossly.

Sarcoma.—The large size of the sarcomatous tumor, its frequent encapsulation, its mobility, and lobulation, and the history of the mass having reached a large size in a comparatively short time, serve as valuable points in differentiating this condition from tuberculous mastitis.

Benign fibro-epithelial tumors are seldom confused with tuberculosis of the breast, since they are usually freely movable, sharply

circumscribed, show no skin involvement, and are not associated with lymph node enlargement.

Chronic cystic mastitis rarely excites suspicion of tuberculosis. It is usually of longer duration than tuberculous mastitis, and may have had its beginning 20 to 30 years before the patient presents herself for examination, whereas patients with tuberculous mastitis usually come under observation much earlier. Deaver and McFarland[11] found the average duration of the primary cases of tuberculous mastitis to be 10.1 months, and that of the secondary cases 11.2 months. These cases average 13.7. Cystic mastitis is usually bilateral, while tuberculosis of the breast is as a rule unilateral. Pain is of more frequent occurrence in cystic mastitis than in tuberculous mastitis, and is usually more severe for several days prior to the onset of menstruation. Skin involvement is frequent in tuberculosis, but infrequent in cystic mastitis, except in very far advanced cases of long standing. The nipple is more frequently retracted with tuberculosis than with cystic mastitis. Aspiration and bacteriologic study of the fluid obtained from a cystic lump will sometimes clear up the diagnosis. If acid-fast bacilli are found, one can, justifiably, make a diagnosis of tuberculosis, even though the tissues later fail to show such changes. Axillary adenopathy may be associated with either condition and is of no diagnostic significance. A very occasional case of cystic mastitis may present all the clinical features of tuberculous mastitis, even to sinus formation, and in such instances, the diagnosis can only be established definitely by biopsy.

A *gumma* of the breast is so rare that it need hardly be considered. As in other organs, a negative serologic reaction does not completely exclude the possibility of one. A provocative reaction, and a therapeutic test should also be made.

Cutler[18] showed that plasma cell mastitis could be differentiated from carcinoma by its rapid regression within two or three weeks following very little radiation, since they are so radiation sensitive. This same therapeutic test, together with the relatively acute onset, help differentiate it from tuberculosis.

A history of injury to the breast should focus our attention on a possible fat necrosis, which may resemble either a carcinoma or tuberculosis.

So much for those cases in which there is no sinus, but, after sinus formation has occurred, one must rule out simple pyogenic mastitis, degenerated gumma, actinomycosis, and carcinoma.

Simple pyogenic mastitis usually runs a more acute course than

tuberculous mastitis. In the chronic stage, pyogenic mastitis can be recognized only by the failure to demonstrate tuberculous granulation tissue in the curettings from the sinuses. Even this method may not be accurate in differentiating between the two conditions, because, if a tuberculous lesion is complicated by secondary pyogenic infection, the typical histology of tuberculosis may not be seen. Tubercle bacilli may or may not be found in such cases. Degenerated gummas may be differentiated in the same manner as the undegenerated ones. Actinomycosis is also extremely rare, and may be diagnosed by the demonstration of the ray fungus in the discharge from the sinus. Carcinoma with sinus formation may be differentiated from tuberculosis only by biopsy or by microscopic study of curettings from the sinus.

It is obvious that the above differential points will not be sufficient to make a positive diagnosis in many instances. This is particularly true in the differentiation between tuberculosis and carcinoma. Biopsy and histologic study afford the only really dependable method for accurate diagnosis, and a frozen-section diagnosis should be made in every instance in which there is a lump of doubtful nature in the breast.

Prognosis

Patients with primary tuberculosis of the breast are usually in good health, and the prognosis is excellent in properly treated cases. In untreated cases, the disease may spread to involve other organs, especially the intrathoracic viscera and it may eventually prove fatal. In the case of secondary tuberculosis of the breast, the prognosis depends entirely upon the activity, location, and the extent of the primary focus.

Treatment

The treatment of primary tuberculosis of the breast is surgical. The majority of observers agree with Hall[19] that curettage, cauterization, injection of sinuses and cavities, and aspiration and incision of abscesses are inadequate and dangerous. Berger and Mandelbaum[15] said simple excision of the lesion is all that is necessary when the condition is well-localized (discrete nodular variety). McGehee and Schmeisser[12] stated that the early lesion may be removed with a margin of normal tissue. However, as stated by Adair,[20] "Frequently a local segmental removal of a section of the breast is not curative, because the sinus tracts are tortuous and the operator is quite apt to leave behind an area of tuberculous mastitis in which another abscess will develop later." Many authorities advocate simple mastectomy in all cases, and, in our opinion, this is the procedure of choice, and as Harrington[14] pointed out, the most con-

servative therapy. This may be followed by roentgenotherapy applied over the regional lymph nodes. Adair and others recommend axillary dissection when the axillary nodes are involved. Harrington also recommended dissection when the process is extensive. Radical mastectomy is indicated only in the rare cases when pectoral muscles and axillary nodes are involved in the tuberculous process. X-ray therapy might be helpful in early and well-localized lesions, but, so far, this type of therapy has not received sufficient trial to justify definite conclusions as to its efficacy. It may have been responsible for the improvement in the above reported case. Heliotherapy is recommended. Generalized body exposure to the ultraviolet ray, with additional radiation over the local lesion, should offer the most benefit. This should prove of value in conjunction with surgery. Tuberculin ointment inunctions are recommended by some, but in the few instances that these have been used, they have not proved to be effective.

In addition to special measures, general measures, such as diet, rest, fresh air and sunshine, are of importance. The patient should also be instructed to avoid any unnecessary strains, such as exhausting occupations, physical activities, or pregnancy.

Report of Cases

Case 1.—Mrs. M. S., aged 42, was admitted on Nov. 11, 1929, complaining of a small tumor in her right breast of approximately two years' duration. She described the tumor as being about the size of a pecan when she first noticed it, and stated that it remained about that size for approximately one year, then began increasing in size, and grew rather rapidly until the time of admission. In September she had begun to have pain and tenderness in this breast, the overlying skin had become reddened and the entire breast seemed to increase in size somewhat.

Past History.—This was significant in that she had "abscesses" on her neck in 1920, which were stated to have been of tuberculous nature; a history of trauma to the breast, occurring when her baby's head fell against the breast, in 1919, was elicited; and it was stated that she had mastitis six months before admission. She had nursed her three children; the periods of lactation being uneventful.

Family history revealed that her maternal grandmother had died of cancer of the breast. There was no history of familial tuberculosis.

Physical Examination.—The upper and outer quadrants of the right breast were occupied by a hard, slightly tender mass, which was described as giving the impression of "cystic malignancy" in places. The skin over this area was reddened and slightly thickened. The entire breast was more prominent than the opposite one, and the superficial veins were more noticeable than on the normal breast. The nipple was not retracted. Over the anterior axillary fold, at the periphery of the tail of the right breast, there was an old draining sinus (fig. 1). Two or three enlarged nodes were felt in the axilla on this side.

The blood Wassermann was negative. Roentgenograms of the chest revealed no evidence of active tuberculosis or metastatic tumor. There was some increase in the size and density of the hila and occasional, small calcified deposits in the perihilar regions. The pulmonic markings were accentuated at the bases, and there were signs of an old pleurisy at the left base and in the left costrophrenic angle.

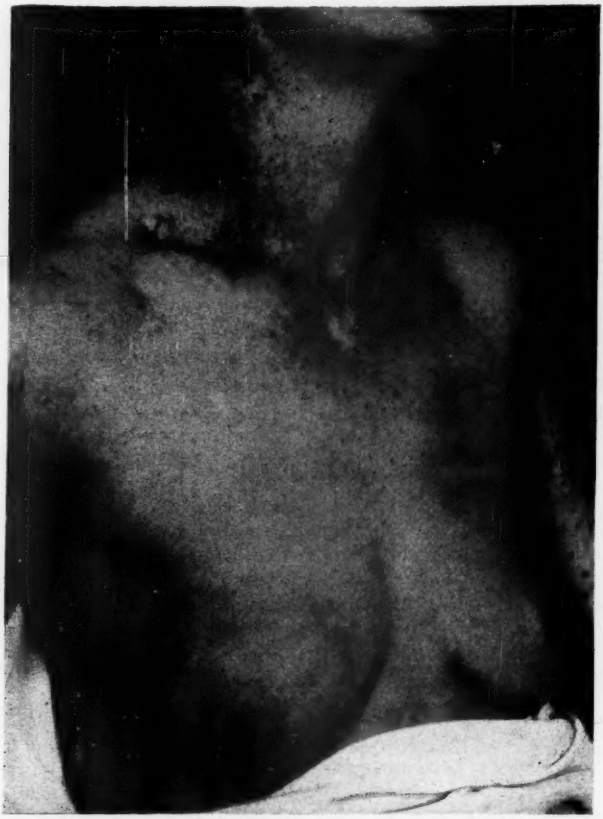


Fig. 1. The sinus type of disease: sinus may be seen over anterior axillary fold; also old scars in supraclavicular area and on neck (case 1).

Preoperative Diagnosis: Tuberculosis of the breast.

Operation.—Nov. 16, 1929, a simple mastectomy with removal of the axillary nodes was performed. About one teacupful of greenish-white pus was encountered in the breast tissue. Upon sectioning the organ, the cut surface revealed a cystic cavity 3 cm. in diameter, lined by granulomatous material and surrounded by a zone of dense fibrous tissue occupying the greater part of the breast.

Pathologic Examination.—Microscopic: Sections from the wall of the cyst showed an extensive granulomatous inflammation, with necrosis; lymphocytic

infiltration; endothelial proliferation; and giant cells. Sections of the lymph nodes showed numerous tubercle formations.

Histologic Diagnosis: Tuberculosis.

The postoperative course was uneventful. The wound was well-healed when she was dismissed from the hospital, Nov. 23, 1929.

Subsequent Course.—The patient was not seen again until Oct. 7, 1937, when the attending physician recorded a small ulceration at the site of one of the suture marks near the medial end of the mastectomy scar.

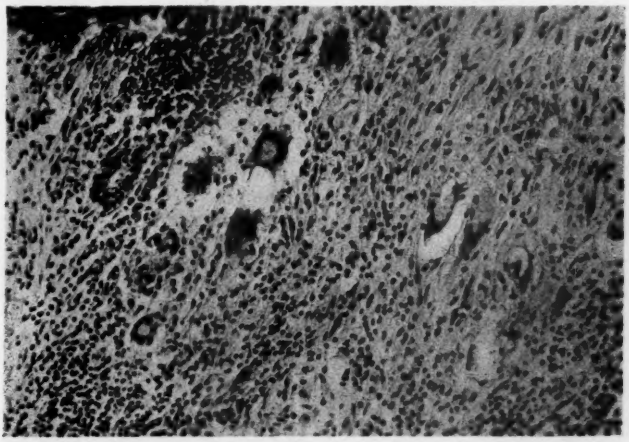


Fig. 2. Photomicrograph of a section from the breast (case 1). (Courtesy of Dr. E. L. Bishop).

On May 25, 1940, examination revealed a small superficial sinus in the skin near the medial end of the scar. She stated that this sinus had drained at intervals since the operation, and that there was a special tendency for the lesion to break down and drain when she allowed her general health to run down, and then it would heal when she took the necessary measures to build herself up again. In addition to this sinus there was another small superficial sinus in the skin over the upper left anterior axillary fold which she stated had appeared only two or three weeks previously.

CASE 2.—M. G., a colored woman, aged 69, was first admitted June 5, 1931, with signs and symptoms of carcinoma of the cervix, but two biopsies were reported as showing no evidence of malignancy.

On May 22, 1939, she was readmitted complaining of what she described as being a hard pimple on her left breast. She stated that this lesion had been present for four or five weeks, and that there had been little, if any, increase in its size since it first appeared. The lesion was not sore or painful. There was no discharge or bleeding from the nipple. Family history was negative for tuberculosis. The patient had nursed three children. During the first lactation, 49 years previously, she developed an abscess of the left breast which required incision and drainage, but this healed within two or three weeks. Three years after the birth of her last child, 34 years previously, she had a "sore about the size of a quarter" on the left breast just beneath the nipple.

She was unable to describe this so-called "sore," but said that it had been excised, after which prompt healing occurred.

Physical Examination revealed a discolored, flattened area, 1.5 cm. in diameter, at 6:00 o'clock, in the areola of the left breast near its periphery. This area was hard, not tender, and it extended into the breast somewhat. The adjacent nipple was partially retracted, and she stated that it had always been retracted, and that it had been difficult for her babies to nurse this breast. A peculiar dimpling of the skin of the lower portion of the breast beneath the flattened area in the areola was noted, and this portion of the breast had a somewhat drawn-up appearance (fig. 3). Numerous small hard nodes were felt in the left axilla, and there were one or two nodes in the right axilla also.

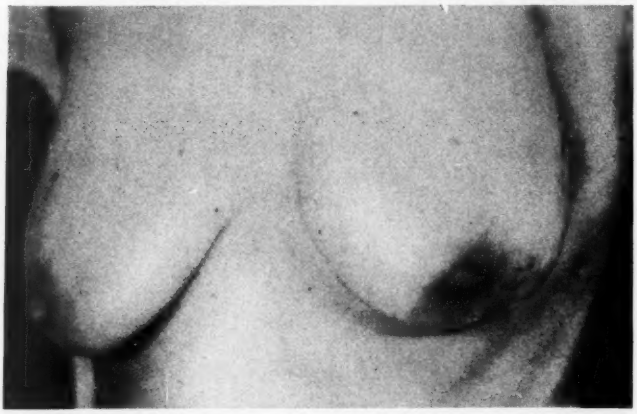


Fig. 3. The sclerosing type (case 2).

Roentgenograms of the chest revealed moderate increase in the size and density of the hila, and rather marked accentuation of the pulmonic markings in the lower lobes, especially on the right. Several small calcifications were apparent in each perihilar region. The heart showed a "mitral configuration." The roentgenologic diagnosis was chronic bronchitis; mitral heart disease. There was no sign of active tuberculosis or metastatic tumor. Blood Wassermann was negative.

Tentative Diagnosis: Carcinoma of the left breast.

A total of 1,200 r was given over the breast and axilla. Operation was contemplated on June 13, 1939, but she developed an upper respiratory infection and it was postponed. This respiratory episode persisted approximately two months. On July 18, 1939, (a little over a month after onset of respiratory infection), the radiologist expressed the opinion that the breast lesion was probably tuberculous rather than carcinomatous. Accordingly only a simple mastectomy was performed, Oct. 8, 1939.

Pathologic Examination.—Gross: This revealed a small, firm tumor just under the skin adjacent to the nipple. *Microscopic.*—Sections from this tumor revealed a partly degenerated area of lymphocytes and plasma cells in a loose stroma. There were a number of giant cells, together with traces of calcification and fibrosis.

Histologic Diagnosis: Tuberculous mastitis.

The postoperative course was uneventful, healing occurring by primary intention. When last seen, June 3, 1940, there was no evidence of disease.

CASE 3.—Mrs. M. N., aged 46, was admitted Oct. 1, 1927. Three months prior to this she had developed a pain in her right breast, which was followed shortly by redness, swelling, tenderness and apparent abscess formation. The abscess ruptured spontaneously after about a week and drained a thick, white pus. The resulting sinus healed after a few days, but the pain and soreness recurred, and she reopened the sinus with a needle to encourage drainage. After this there was healing of the sinus with subsequent reopening several times before she applied to the Clinic.

When questioned in regard to trauma, she stated that she was not certain, but that there was a possibility that this breast might have been struck just prior to the onset of the present illness.

A family history of tuberculosis was not elicited. She had had 11 normal lactations. There was no history of previous mastitis in either breast.

A long, narrow, firm, freely movable mass, 7 by 2.5 cm., extended radially from the nipple into the upper and outer quadrant of the right breast. In the areola of this breast, just above and mesial to the nipple, there was a small draining sinus which apparently extended into the medial end of the mass in the breast. The nipple was not retracted, and there was no skin fixation over the mass. One small soft axillary node was palpable. Blood Wassermann was negative.

Preoperative Diagnosis: Tuberculosis of the breast.

X-ray of the chest showed no evidence of active tuberculosis or metastatic neoplasm. There was some increase in the size of the hila, and accentuation of the pulmonic markings at the bases. There were also occasional small perihilar calcifications. On October 12, 1927, a simple mastectomy was performed.

Pathologic Examination.—Gross: Sections of the mass in the breast showed a dense fibrous tissue in which there were sinuses filled with a yellowish-green purulent exudate. *Microscopically,* the mass showed widespread productive inflammation, with proliferation of the fixed tissue cells; infiltration of round cells, and the formation of rounded tubercles; and the presence of large numbers of giant cells in various stages of development.

Histologic Diagnosis: Tuberculosis of the breast.

Follow-Up.—June 14, 1940: No evidence of disease was found. She has been well ever since operation.

CASE 4.—Mrs. L. B., aged 17, was admitted, on Dec. 22, 1939. One year earlier following an abortion at two months, she had developed an abscess of her left breast, which became swollen, tender, and painful. After a time it ruptured spontaneously, draining a thick, purulent material. This drainage continued at intervals for the next six months, then subsided. Upon admission she stated that this breast had not drained since June. In October the right breast had become sore and hard; about two weeks later an abscess within this breast ruptured spontaneously and drained purulent material. The drainage from this breast persisted and was still present upon admission. Family history was negative for tuberculosis. Past history was nonessential, except for the abortion preceding the trouble with her breasts, which was her first pregnancy.

Physical Examination.—A draining sinus was situated, at 3 o'clock, just outside of the areola on each breast. There was a mass of exuberant granulation tissue around the opening of the sinus in the left breast, and there was little drainage from this sinus. The sinus in the right breast seemed to be more recent, and the drainage was more abundant. The skin of the right breast was hyperemic (fig. 4). Both breasts were hard, caked, and tender. Three soft nodes, from 1.5 to 2 cm. in diameter, were felt in the right axilla and two in the left. A smear made from the exudate obtained from the sinus of the right breast showed numerous acid-fast bacilli, with morphologic characteristics of tubercle bacilli. Smears from the left breast were negative, but there was not a sufficient amount of exudate to make satisfactory smears from this side. The blood Wassermann was negative.

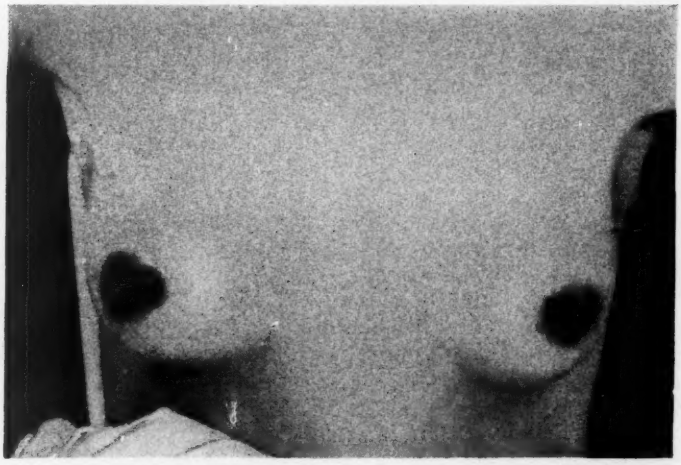


Fig. 4. Bilateral tuberculosis with a sinus in each breast (case 4).

X-ray of the chest showed no evidence of active tuberculosis or neoplasm. The hila were slightly increased in size and density, and the pulmonic markings at the bases were slightly accentuated. Several small perihilar calcifications were noted on each side.

Tentative Diagnosis: Bilateral tuberculous mastitis.

Since the patient was young, it was decided that an attempt should be made to save the breasts, and a conservative type of therapy consisting of general hygienic measures, administration of vitamin D, wet dressings to both breasts, and roentgenotherapy was instituted. She received a total of 300 r over both breasts. On Feb. 12, 1940, (approximately six weeks after admission) she stated that she had not had a regular menstrual period since Dec. 9, 1939. Pelvic examination at this time revealed typical findings of pregnancy at two to two and one-half months. There had been no noticeable improvement in the condition of the breasts under the regime of conservative therapy. In fact, she complained of having a great deal more pain in the breasts than she had had when first admitted, and she expressed a desire to have both breasts removed surgically in order to relieve the pain. With pregnancy complicating the condition and its failure to improve under conservative therapy, it was

decided that bilateral, simple mastectomy would be the procedure of choice. On March 1, 1940, this operation was performed.

Pathologic Examination.—Gross: Section of the right breast, in the region of the sinus, showed the lesion to be superficial. There was only a small area of abscess formation joining the cutaneous sinus just beneath the skin. The remainder of the breast was grossly normal. Section of the left breast revealed a small superficial scar-like area at the site of the healed sinus.

Microscopic sections from the wall of the sinus on the right revealed a large area of infiltration of lymphocytes and plasma cells, with smaller areas of leukocytes. Fibrous proliferation was also present, and some areas were loosely arranged, and of granulomatous type, with suggestion of tubercle formation and occasional giant cells. The outer portion of this involved area was fibrous and cellular. Several ducts contained necrotic material, and three giant cells were found in one duct. The acini were fibrous and inactive. The histologic picture was not typical of tuberculosis. Tubercle bacilli were not demonstrated in sections stained with acid fuchsin, but numerous acid-fast bacilli had been found in smears made from the open sinus. Sections from the healed sinus in the left breast showed marked fibrous replacement of the mammary structure, with small slightly scattered areas of lymphocytes and plasma cells, but no necrosis, giant cells or tubercles. *Histologic Diagnosis*: Tuberculosis of the right breast; probable tuberculosis of the left breast.

Postoperative Course.—This was essentially uneventful, except for a small slough of skin edges, and secondary infection of both operative wounds, which cleared up rather promptly, and healing occurred without grafting.

When last seen, Nov. 25, 1940, she showed no evidence of disease, and she said her baby appeared to be perfectly well.

Comment.—While histologic evidence of tuberculosis could not be demonstrated, it is felt the history, plus finding tubercle bacilli from one side, justify classing this as one of bilateral tuberculous mastitis.

CASE 5.—M. H., a negro woman of 38, was admitted on Sept. 24, 1939, complaining of a "knot" in her right breast. She stated that this knot had appeared approximately nine weeks previously, and that it had followed an injury sustained when she fell, striking her breast against a chair. It had increased in size rather rapidly. She had experienced frequent sharp, shooting pains in the knot, especially at night, ever since she first noticed it. There had been no bleeding or discharge from the nipple.

The family history was negative for tuberculosis. She had married at an early age, and her husband had been dead fifteen years. She had one miscarriage at six months the second year after she was married, and one delivery at eight months, the third year after she was married. The eight-month infant lived one day. There were no other pregnancies and no lactations; and she gave no history of previous trouble with her breasts. In 1937 she had received 12 antisyphilitic injections, seven intramuscularly, and five intravenously.

Physical examination revealed a firm but seemingly cystic, non-tender, rounded mass, approximately 4 cm. in diameter, at the periphery of the lower inner quadrant of the right breast. There was some question as to whether this mass was located in the breast tissue or whether it was actually outside of the breast. The mass was firmly adherent to the underlying costochondral

junction of the seventh rib. The overlying skin showed no apparent fixation and no discoloration. Blood Kahn was negative. Roentgenograms of the chest were negative for tuberculosis. There was some widening of the aortic shadow.

On Oct. 7, 1939, the mass was aspirated, and approximately 2 cc. of thin, cloudy fluid obtained. Smears from this fluid were reported as showing no evidence of tumor or acute infection. At this time, the opinion was that the mass was inflammatory, either gumma or tuberculosis, probably gumma, and she was referred to the Venereal Clinic for further antisyphilitic therapy. She received 14 intravenous injections of neoarsphenamine, and 17 intramuscular injections of bismuth subsalicylate.

On May 25, 1940, this treatment had produced little change in the mass, except that fixation to the chest wall seemed a little less marked. There was an enlarged, freely movable lymph node in the corresponding axilla. On June 3, 1940, the mass was excised. It proved to be a chronic abscess with a fibrous wall, about 1 cm. thick, and a central cavity filled with greenish exudate. The lining of the cavity was composed of a yellowish, necrotic material. During the process of removal the abscess was ruptured, and a portion of its contents spilled into the wound. A silkworm-gut drain was left in the wound.

Pathologic Examination.—Microscopic sections from the wall of the abscess showed an extensive granulomatous inflammation with vascular connective tissue, lymphoid infiltration, and the formation of a few slightly atypical tubercles, with fairly numerous giant cells. Massive necrosis was present in some parts. There was little remaining breast tissue in the sections, but a few small ducts and occasional atrophic acini were noted.

Histologic Diagnosis: Tuberculosis of the breast. Healing was apparently satisfactory, and she was discharged June 15, 1940.

CASE 6.—Mrs. T. M. P., aged 28, was admitted May 25, 1933, complaining of a knot in left breast, first noticed nine months previously. She had had two pregnancies, the last baby having been weaned 2½ months prior to admission, at the age of 8½ months. The knot caused no trouble except when the baby was weaned; and there had been no appreciable increase in size, nor any discharge from the nipple. On June 1, lump was excised.

Pathologic Diagnosis: Chronic abscess; probably sterile.

On Oct. 2, 1933, she noticed the areola of the right breast was becoming red, and that there was a tender nodule beneath the nipple. Twelve to 15 drops of purulent fluid were obtained with a breast pump (no examination for acid-fast bacilli was made).

On Jan. 22, 1934, nothing was obtained with the breast pump. Because of extensive mastitis and very poor support of breasts, bilateral mammopexy was advised. A good cosmetic and functional result was obtained.

In May, 1934, a purulent discharge was obtained from the left nipple which continued for several months. This condition was treated by hot applications and a breast pump. In October, 1934, she was treated for metrorrhagia.

In May, 1936, she noted a caseous discharge from each nipple, not obtainable with breast pump, but by manual pressure. In August, a papillomatous growth developed on the right nipple. In June, 1937, she said that she had obtained this caseous material from the right nipple; and that she had "been sick ever since the operation." In May, 1938, caseous material was still obtainable from right nipple and nodular enlargements were noted in the right breast.

In March, 1939, an indurated area was noted beneath the right areola. This was incised and pus obtained. Another abscess developing in June was also incised. A sinus persisted, and has drained pus off-and-on ever since but it was not until September, 1940, that a possible tuberculous infection was suspected; an examination of this pus showed innumerable acid-fast bacilli. Roentgenograms of chest revealed no evidence of tuberculosis. On Oct. 10, 1940, simple mastectomy was performed.

Pathologic Examination.—"Sebaceous cyst of the areola; moderate productive mastitis with occasional small duct cyst. I am unable to demonstrate any histologic evidence of tuberculosis, but am satisfied that tuberculosis is present somewhere, as acid-fast bacilli were extremely numerous in the smears of the discharge from the nipple."

Comment.—It is interesting to speculate as to whether this patient had tuberculosis of the other breast eight years ago. Dr. Bishop reviewed the sections and could not find any evidence of tuberculosis. But for the acid-fast bacilli, demonstrated in the discharge from the right nipple, the diagnosis would never have been made.

CASE 7.—E. C., a colored woman of 24, was admitted on Oct. 18, 1940, complaining of "lumps in right breast." Three weeks previously, she had discovered a lump in the medial portion of the right breast, which she estimated was one inch in diameter. It doubled in size in the intervening three weeks. It was not tender until one week before. There had been no discharge from the nipple. In 1933, she had one child, who was nursed eight months.

The right breast was larger than the left, with a firm, oval mass in the medial portion about 8 cm. in diameter. The surrounding tissue showed some fixation. There was no retraction of the nipple. Five or six drops of a yellowish, oily fluid were obtained from the nipple with a breast pump. No nodes were palpated in the axilla or supraclavicular spaces.

All the house staff thought this was a carcinoma, but one of us (W.P.N.) felt that because of her age, the rapidity of growth, the slight tenderness, and redness of skin, the diagnosis of a low-grade infection was more likely. In spite of the fact that this paper was in process of preparation, he failed to consider tuberculosis.

At operation, the breast was found to be honeycombed with abscesses, which were drained, and a piece of the abscess wall removed for examination, which showed: "Tuberculous mastitis with secondary infection."

Comment.—This case emphasizes the necessity of always keeping tuberculosis in mind. Even when we were gathering material and reviewing the literature, we failed to make a diagnosis, though we thought it was a low-grade inflammatory lesion.

SUMMARY

The history, incidence, classification, etiology, symptoms and differential diagnosis of tuberculosis of the breast have been reviewed and seven additional cases reported. In this small series, the incidence has been low (0.54 per cent); the age, sex, and marital status were as usually reported: each patient had been pregnant, there was no family history of tuberculosis, and in only one case

could any other tuberculous focus be found to have existed; one apparently bilateral case is included; the condition was correctly diagnosed in each case but one; in all but one simple mastectomy was performed, and the result has been good in every case (shortest two months; longest 13 years; average postoperative follow-up, six years).

Conclusions

Tuberculosis of the breast is an infrequent lesion, but, when recognized, it can easily be cured. The surgical treatment of choice is simple mastectomy. General hygienic measures should be instituted for possible primary foci elsewhere in the body. In all atypical cases of supposed carcinoma, suspect tuberculosis of the breast. In atypical abscesses of the breast, and whenever a purulent discharge is obtained from the nipple or a sinus in the breast, look for acid-fast bacilli.

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SECTIONAL MEETINGS

Georgia

The Thomas County Medical Society were hosts to the clinical conference of the Georgia section of The Southeastern Surgical Congress on September 17. The meeting was held at The Archbold Memorial Hospital in Thomasville. Dr. T. C. Davison, of Atlanta, presided. Luncheon was served at the Hospital. The program follows:

Ruptured Ectopic Pregnancy: Dr. J. C. Davis, Quincy, Fla.

Carcinoma of the Uterus: Dr. Gilbert F. Douglas, Birmingham.

Kidney Ptosis: Dr. J. U. Reeves, Mobile.

Tumors of the Rectum: Dr. George Eubanks, Atlanta.

Tumors of the Breast: Dr. Fred Waas, Jacksonville.

Compound Fractures: Dr. H. W. Jernigan, Atlanta.

Peptic Ulcer: Dr. George W. Fuller, Atlanta.

Acute Appendicitis, Ruptured: Dr. J. C. Patterson, Cuthbert, Ga.

Tennessee

The Tennessee section of The Southeastern Surgical Congress held its annual clinical conference at the New Southern Hotel, Jackson, Tennessee, on October 7. Dr. Herbert Acuff presided. The program follows:

Acute Appendicitis: Dr. Glenn D. Batten, Jackson, Tenn.

Salpingitis: Dr. W. G. Thea, Paris, Tennessee.

Collapse Therapy in Pulmonary Tuberculosis: Dr. George D. Boone, Paris, Tennessee.

Perforated Peptic Ulcer: Dr. Charles Webb, Jackson, Tennessee.

Breast Tumors: Dr. John W. Oursler, Humboldt, Tenn.

Kidney Pain: Dr. Julian G. Price, Dyersburg, Tenn.

At the luncheon, which was served at the New Southern Hotel, Dr. B. T. Beasley, of Atlanta, Secretary-Treasurer of the Congress, delivered an address on The Future of the Southeastern Surgical Congress.

PIEDMONT POSTGRADUATE MEDICAL ASSEMBLY

The seventh annual meeting of the Piedmont Postgraduate Clinical Assembly was held in the Anderson County Hospital, Anderson, South Carolina, on Sept. 9, 10, and 11. The meetings were well attended as usual, and considerable interest shown in all clinical topics presented.

The Faculty was particularly strong this year and included Dr. Robert B. Greenblatt, Augusta; Dr. Franklin B. Peck, Indianapolis; Dr. Frederick F. Boyce, New Orleans; Dr. H. Sheridan Baketel, Jersey City; Dr. Tinsley R. Harrison, Wake Forest; Dr. Arthur Grollman, Baltimore; Dr. William McNider, Chapel Hill; Dr. Frank P. Coleman, Columbia; Dr. John A. Kelly, New York; and Dr. Kenneth Lynch, Charleston. Atlanta had a strong representation in Dr. Roy R. Kracke and Dr. C. W. Roberts. The clinical material selected for discussion by each of these men proved to be exceptionally interesting and provoked timely discussions.

The members of the Anderson County Medical Society acted as hosts for the Assembly and provided all facilities to make it a pleasant as well as successful meeting. The banquet was held on Wednesday evening with Dr. J. Dechard Guess, President of the Assembly, acting as toastmaster. A touch of sadness centered about the fact that during the past year Dr. E. A. Hines, coörganizer and the first president of the Assembly, had passed on.

As is customary, the third day of the Assembly was turned over to the South Carolina Division of the Southeastern Surgical Congress headed by Dr. J. R. Young. He presided at a luncheon for visitors and guest speakers at the John C. Calhoun Hotel and also at the afternoon session of the Assembly.

The Assembly this year was featured by several interesting scientific exhibits which added considerable interest. Several commercial exhibits were also presented and provided many additional reasons for calling this the most successful meeting of the Assembly.

ETHER CENTENNIAL

The life of Crawford W. Long, the discoverer of ether as an anesthetic agent, will be dramatized by the Atlanta Theater Guild as a part of the program of the Postgraduate Surgical Assembly of The Southeastern Surgical Congress, when it convenes in Atlanta March 9, 10 and 11, 1942.

Dr. Frank L. Belyeu, President of the Atlanta Theater Guild, is working in conjunction with Dr. Frank K. Boland and Dr. B. T. Beasley in arranging this four-part play which will be presented Tuesday evening, March 10.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

A TEXTBOOK OF OPHTHALMOLOGY. By SANFORD R. GIFFORD, M. A., M. D., F. A. C. S., Professor of Ophthalmology, Northwestern University Medical School, Chicago; Attending Ophthalmologist, Passavant Memorial and Cook County Hospitals. 470 pages, with 228 illustrations, 28 in color. Second edition, revised. Price, $4. Philadelphia and London: W. B. Saunders Company, 1941.

The success of Dr. Gifford's Ophthalmology three years ago would have satisfied many men. He however was only encouraged by it to bring out a second edition, improving the original in certain respects and also bringing out the latest studies of the relationship between fundus changes and cardiovascular-renal diseases. He also gives the latest on the sulfonamides, heparin and the vitamins with regard to the eye.

While few readers of THE SOUTHERN SURGEON specialize in ophthalmology (this book indeed would prove elementary for those who do), some of our friends who confine their work to obstetrics have recently become expert in the examination of the fundus, and they report that the knowledge so gained has proved invaluable in the handling of their patients who have hypertension or who develop the toxemias of pregnancy. Others might profit by their experience. The man who wants to learn about the fundus will derive inestimable help from this book with its beautiful pictures of the retina.

THE CARE OF THE AGED (GERIATRICS). By MALFORD W. THEWLIS, M. D., Attending Specialist, General Medicine, United States Public Health Hospitals, New York City; Attending Physician, South County Hospital, Wakefield, R. I.; Special Consultant, Rhode Island Department of Public Health. Third Edition, Entirely Rewritten. 579 pages, with 50 illustrations. Price, $5. St. Louis: C. V. Mosby Company, 1941.

Four years ago Barney Brooks stated, "The half million old men and women of 1850 could be told that they were too old to be operated on, but in 1950 the twelve and one-half millions of corresponding ages will consider themselves too young to be so carelessly dealt with." That makes a good introduction for this new book on geriatrics,—and the third edition of *The Care of the Aged,* having been completely rewritten and brought up to date, *is* a new book.

Dr. Thewlis gives a history of the subject, he arraigns the neglect of the aged and points out their value to the world. He discusses the hygiene of old age, the prevention of premature senility and similar problems. He goes into physiology and pathology and general care of the elderly before taking up specific conditions. He gives an excellent chapter on surgery in the aged.

The author is widely read, cultured, of broad vision and great sympathy. While there is an occasional detail that seems questionable to this reviewer, there can be no question that the book is of the utmost value, especially in exciting *interest* in the problems of the elderly. He has certainly impressed upon at least one reader that old people not only deserve better care than they sometimes receive but also that a great deal can be done for them by one who is really interested.

CLINICAL IMMUNOLOGY, BIOTHERAPY AND CHEMOTHERAPY IN THE DIAGNOSIS, PREVENTION AND TREATMENT OF DISEASE. By JOHN A. KOLMER, M. S., M. D., Dr. P. H., Sc. D., LL. D., L. H. D., F. A. C. P., Professor of Medicine, Temple University School of Medicine; Director of the Research Institute of Cutaneous Medicine, and LOUIS TUFT, M. D., Assistant Professor of Medicine and Chief of Clinic of Allergy and Applied Immunology, Temple University School of Medicine. 941 pages, with 50 illustrations, 23 in color. Price, $10. Philadelphia and London: W. B. Saunders Company, 1941.

The imposing title of this book may cause apprehension in the minds of many men, and one must admit that it is still possible to practice a good grade of medicine without this volume. On the other hand, it should be emphasized that this work was prepared for the clinician, and there can be no doubt the most "practical" man will find it a very valuable work of reference. While the authors have written as clearly as possible about the esoteric foundations of immunology, they have been careful not to go into detail as to laboratory tests. The sections on septicemia, meningococcal diseases, tetanus and gas gangrene are fine. The discussions of the rarer infectious diseases are perhaps the best extant in English.

A TEXTBOOK OF CLINICAL PATHOLOGY. Edited by ROY R. KRACKE, and FRANCIS P. PARKER, Emory University, Georgia, with 12 contributors. Second Edition, extensively revised and enlarged. 780 pages, with 223 illustrations. Price, $6.00. Baltimore: The Williams & Wilkins Company, 1940.

Congratulations to two of our own Southern teachers and pathologists who edit and contribute to this splendid new edition of a good textbook! It is a teaching text for students, and a ready reference for practitioners. The average laboratory worker will not have to look further for information, but he may look much further and not find it so well presented. One must note that, instead of outlining the technic of every procedure that has ever been devised for securing certain information, the authors present only the one that has been time-tested and proved best.

The book is complete and up-to-date, including such determinations as vitamins, hormones, amylase and phosphatase, and sulfanilamide and its derivatives in the blood and urine. In spite of this however it is brief, simple and intensely practical; which takes away the forbidding character of most such texts. In its favor is the fact that it is especially concerned with the interpretation of results, which, after all, is the actual value of the test.

Authoritative authors describe the study of urine, sputum, feces, gastric contents, cerebrospinal fluid, and all other specimens. As might well be expected however the presentation of the blood and its diseases is probably the best part, and the book is a fair substitute for those of us who do not have Dr. Kracke's *Hematology*. Besides the actual laboratory procedures, the technic of obtaining specimens and applying tests to patients is outlined. Special procedures are pregnancy tests, blood cultures, autogenous vaccines, immunologic tests, rabies diagnosis, and examination of seminal fluid. Dr. Elizabeth Gambrell has given excellent chapters on the methods of staining and culture, and there are chapters devoted to laboratory equipment and maintenance, and to laboratory examinations in general practice.

To complete a good book, this one is attractively and substantially bound, it has large, clear type, and abounds in good illustrations, many of them colored, and pictures always tell more than words. The book cannot be surpassed in on the practical.

MEDICAL PROGRESS ANNUAL, 1940: *A Series of Fifty-two Reports Published During 1940 in* THE NEW ENGLAND JOURNAL OF MEDICINE. Managing Editor: ROBERT N. NYE, M. D. 625 pages. Price, $4. Springfield: Charles C Thomas, Publisher, 1941.

It is not an aphorism but rather a platitude to say that today no one human mind can keep up with all the advances in medicine: it is surely difficult to keep up with all the new things in whatever narrow field one's chief interests lie, and to evaluate those that are really worth while. And yet a modern doctor cannot afford to remain in ignorance of any important advances in scientific medicine regardless of the particular field. A number of yearbooks appear in the specialties, but we have not found one that covers the whole field so well as *Medical Progress Annual.*

It is a relief to learn that one is justified in not believing that the apparent increase in carcinoma of the lung is not the result of cigarettes, nor of inhaling gasoline fumes. The discussion of the vitamins is particularly helpful. The section on electrocardiography brings out forcibly that that machine is not a substitute for brains and time in studying a cardiac.

Allen covers abdominal surgery, Thorndyke athletic injuries, Ladd children's surgery, Marble the emergency treatment of fractures; Meigs gynecology, Munro neurosurgery, Barr orthopedic surgery, Smithwick surgery of the sympathetic nervous system, Churchill thoracic surgery and Quinby urologic surgery.

This collection of reviews from our highly honored, ancient but up-to-date *New England Journal of Medicine* is recommended.

A PRIMER FOR DIABETIC PATIENTS: *An Outline of Treatment for Diabetes with Diet, Insulin and Protamine-Zinc Insulin, Including Directions and Charts for the Use of Physicians in Planning Diet Prescriptions.* By RUSSELL M. WILDER, M. D., Ph. D., F. A. C. P., Professor and Chief of the Department of Medicine of the Mayo Foundation, University of Minnesota; Head of Section on Metabolism Therapy, Division of Medicine, the Mayo Clinic. Seventh Edition, Reset. 184 pages, with 8 illustrations. Price, $1.75. Philadelphia and London: W. B. Saunders Company, 1941.

Because of improvement in the procedure of administering protamine-zinc insulin, Dr. Wilder has revised his four-year-old edition of A Primer for Diabetic Patients. The seventh edition is still an excellent manual, and again up-to-the-minute.

JOHNSON & JOHNSON DEDICATE NEW LIGATURE LABORATORY

With a hundred other representatives of the medical and lay press, the Editor of THE SOUTHEN SURGEON had the good fortune to be able to attend the formal opening of the new ligature plant of Johnson & Johnson in North Brunswick, New Jersey, on September 26.

Located in a 250 acre park, the building is of Vermont marble and stainless steel, relieved by a narrow strip of plate glass skirting the sides without the usual framing. Two-thirds of the space is for the processing of ligatures and within the main building there is a second building to be used for sterilization and hermetically sealing of the processed material. Its walls are of Vitriolite plate glass. The whole plant is air-conditioned.

Although this factory is said to be capable of producing ligatures sufficient to supply the needs of the whole country, it has been planned and designed to permit of rapid expansion of production in the event of a national emergency.

In dedicating the structure, Robert W. Johnson, chairman of the board of Johnson & Johnson, said that the company viewed the new laboratory as an "example of a worth-while contribution to the National Defense effort by private industrial management, without Federal financial assistance." Mr. Johnson added:

"The factory of today and tomorrow is built on the sound premise that no longer is there any such thing as 'common' labor. Industry is moving toward the mastery of intricate technologies; but what is more significant of industry's progress is its arrival at the goal of humanitarianism . . .

"Industry owes two paramount obligations. The first of these is its service to its customers. Next is its obligation to those in its employ. Management must provide industrial operators with good pay, short hours, continuity of employment, and an organized opportunity to present grievances as they arise. Management has also a specific responsibility to the community in which it is located. . . .

"Big business is being broken up into little businesses or enterprises within the whole. These unit plants are not only an attempt to develop a good-looking building with pleasant surroundings, but a plan for a greatly simplified form of management with a direct contact with all those who work with it. . . .

"We are aiming at a simplified approach to every industrial task. We believe in the broad policy of high wages and short hours, and will strive to set an example within the limits of sound competition and realistic economics. We believe this form of decentralization makes it possible for all of us to have a better understanding of the individual industrial effort. . . .

"We have passed from national adolescence to national adulthood and, in so doing, each of us must accept the grave responsibilities of maturity. Responsibilities can not be avoided or evaded by management or labor."

Preceding the exercises was a luncheon at the St. Regis Hotel, and following it refreshments were served in the factory.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of THE SOUTHERN SURGEON, published monthly at Atlanta, Georgia, for October, 1941
State of Georgia, County of Fulton.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Dr. B. T. Beasley, who, having been duly sworn according to law, deposes and says that he is the Managing Editor of THE SOUTHERN SURGEON, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, THE SOUTHERN SURGEON PUBLISHING COMPANY, Atlanta, Georgia; Editor, Dr. L. Minor Blackford, Atlanta, Georgia; Managing Editor, Dr. B. T. Beasley, Atlanta, Georgia.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The Southeastern Surgical Congress, Atlanta, Georgia.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is..... (This information is required from daily publications only.)

B. T. BEASLEY, M. D.,
Managing Editor

Sworn to and subscribed before me this 1st day of October, 1941.

HERBERT L. LEWIS,
Notary Public, Georgia, State at large
(My Commission Expires Jan. 2, 1942)

(Seal.)

The Southern Surgeon, the second regional journal devoted to a specialty in the United States, is published by The Southern Surgeon Publishing Company, a subsidiary of The Southeastern Surgical Congress, for the advancement of surgery particularly in the South. In addition to publishing papers presented before the Postgraduate Surgical Assembly of The Southeastern Surgical Congress, and before the Texas Surgical Society, it welcomes good surgical papers regardless of their geographic origin. It aspires to encourage surgeons in the Southern States, especially the younger ones, to record their own observations and original work.

Manuscripts for publication, books for review, and correspondence relating to the editorial management should be sent to the Editor, Dr. L. Minor Blackford, 104 Ponce de Leon Ave., N. E., Atlanta, or to one of the Associate Editors. Other communications should be addressed to Dr. B. T. Beasley, 701 Hurt Building, Atlanta.

Articles will be accepted for publication on condition that they are contributed solely to *The Southern Surgeon*. Manuscripts must be typewritten, double-spaced, and the original copy should be submitted. They are all subject to editing. The cost of illustrations must be borne by the author.

References should conform to the style of the Quarterly Cumulative Index Medicus, published by the American Medical Association. This requires, in order given: name of author, title of article, name of periodical, with volume, page, month (day of month if weekly) and year.

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